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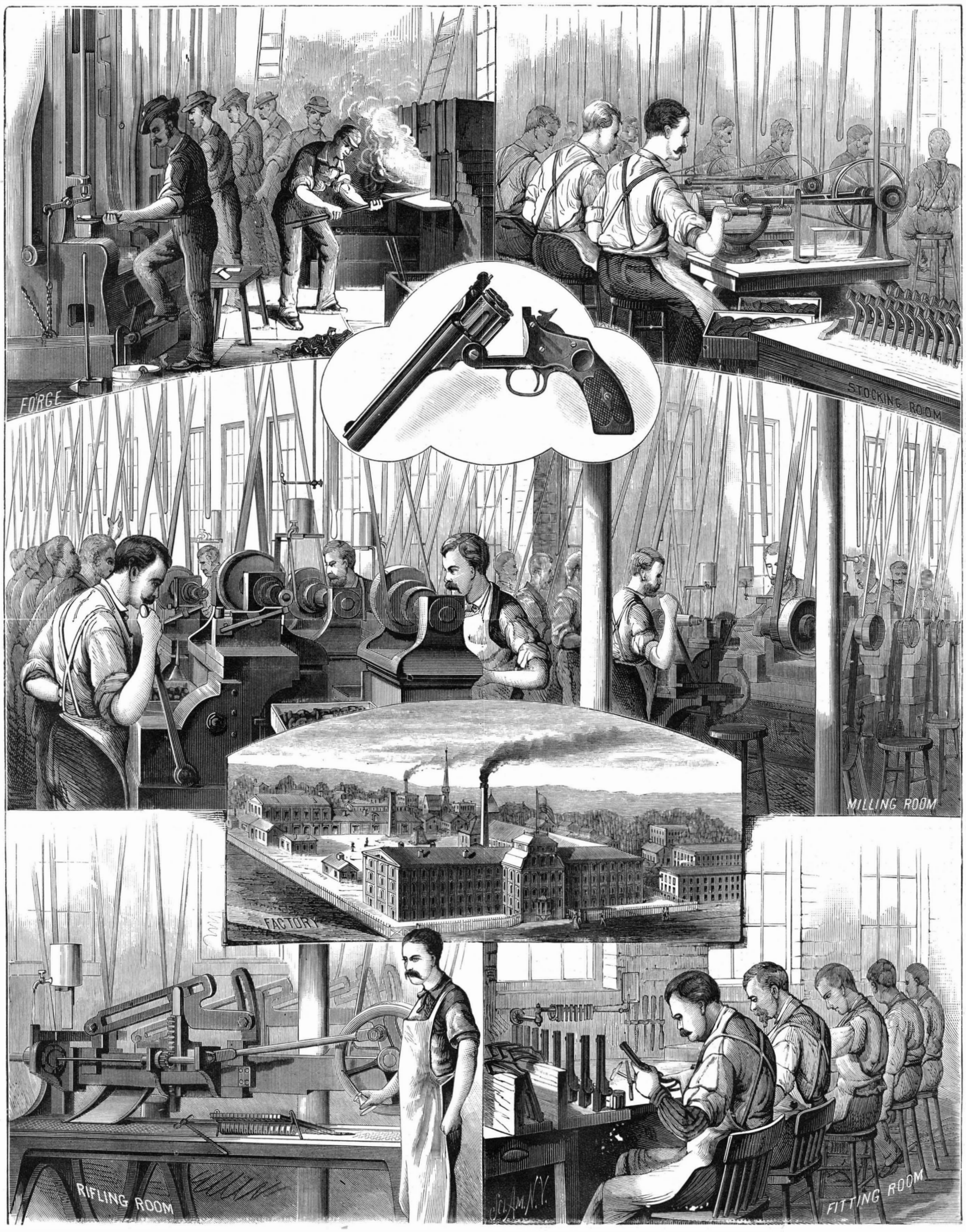

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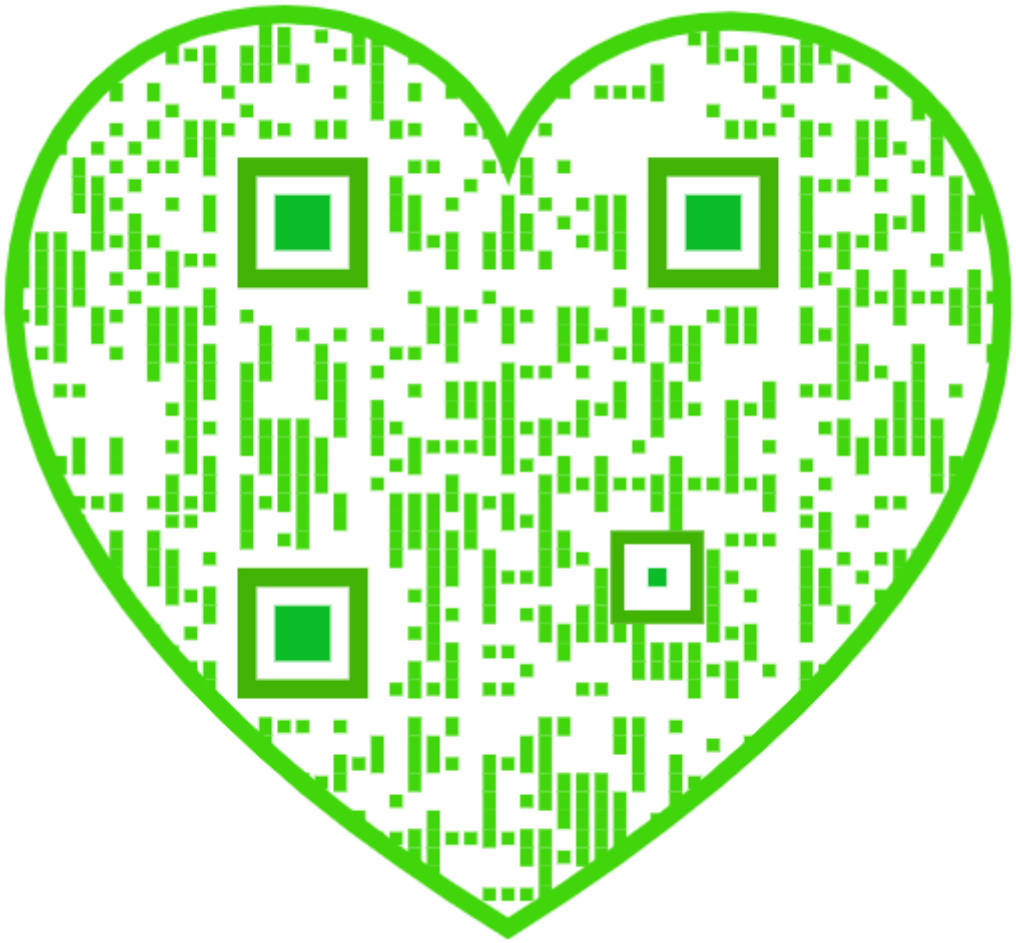

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NEW YORK, SATURDAY, JANUARY 24, 1880.

Contents.

(Illustrated articles are marked with an asterisk.)

American industries*..... 53
Arctic navigation..... 54
Benzoate of soda for diphtheria. 54
Boxwood in Russia..... 52
Bridge bet. N. Y. and B'klyn.... 51
Bridges, iron, of long spans 53
Bright, John, on the U. S..... 50
Bronzing hardware (7)..... 59
Cape of Good Hope..... 51
Carrier pigeons at great altitudes 55
Cattle raising in Wyoming..... 52
Cleopatra's needle, taking down. 48
Commerce of New York..... 48
Coursing through the air..... 50
Dyes from mollusks..... 56
Ecarlate..... 56
Electric lighting in London..... 53
Fire from steam pipes 52
Fishes, instincts and emotions of 56
Fogs, London, cause of..... 56
Foot power for boats (17) 59
Foundations, marine 51
Frog poison of Colombia 55
Gelatinous solution, clar. of *.... 57
Gold, facts about..... 51
Ground, motions of the..... 53
Healthiest city in the U. S 58
Hose nozzle, adjustable, new*... 54
Intermittent fever, cause of..... 58
Inventions, agricultural..... 54
Inventions, mechanical..... 54
Inventions, miscellaneous..... 51
Investment, a safe 51
Iron, pig, advancing..... 50
Iron, to case harden (6)..... 59
Lightning stroke, singular case.. 51
Marble working machine, new... 50
Mechanics, mystery in..... 51
Monument, General Wool's..... 48
Notes and queries..... 59
Nutmegs, how they grow... 56
Optometer, new*. 54
Patent, American, first. 51
Petroleum, ancient.... 54
Photo plates, gelatine 57
Photo process, starch..... 54
Phthisis, German cure for 57
Pigeons by the million 50
Planchette board (1)..... 59
Presence of mind..... 53
Preserve your papers..... 50
Race, buried, in Kansas 48
Reins, hand hold for*..... 51
Revolver fac'y, Smith & Wesson's* 47
Revolvers, manufacture of*..... 53
Rhinoceroses, American, extinct 56
Sewer gas, action of on lead 48
Shawl strap, improved*..... 51
Sieve, novel*..... 50
Silver plating (4)..... 59
Smallpox in the United States.... 58
Soap and shaving box*..... 50
Soundings, deep (27)..... 59
Spring haas, the*..... 55
Steamer, merchant, large..... 50
Steel, preparing..... 56
Straw, to dye..... 56
Sunlight in Norway..... 54
Sun's rays..... 51
Surgery by the electric light.. ... 57
Tap for tin cans, novel* 50
Telegraph wires in New York city 52
Therapeutical action of cold..... 58
Tortoise shell, to polish (8)..... 59
Varnish, euphorbium.... 57
Vase, Chinese* 55
Vise, novel*..... 51
Was Adam a Peruvian?..... 50
Water, hard, softening process... 57
White, Samuel S 52
Yankee, typical, the..... 48

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 212,

For the Week ending January 24, 1880.

Price 10 cents. For sale by all newsdealers.

I. ENGINEERING AND MECHANICS.—New Experiments with regard to the Giffard Injector. 2 figures ....Page 3368
Powerful Pumping Engines. The centrifugal pumping engines of the new steamer Gallia. 2 figures..... .....Page 3369
Interoceanic Canal Projects. By A. G. MENOCAL. A statistical review of the various routes proposed. Lieutenant Wyse's plan.—Canals with locks from Colon to Panama.—The San Blas route.—The Nicaragua route.—Conclusions..... .....Page 3369
Lights for Lighthouses. Reforms proposed for the English lighthouse system. By Sir WM. THOMSON..... .....Page 3372
The Cartometer. A new, simple, and accurate instrument for measuring distances on maps, plans, etc ....Page 3372

II. NAVAL.—The Capture of the Huascar.—A Chilian officer's account of the most notable naval engagement of modern times. Fig. 1. Action between the Peruvian turret ship Huascar and the Chilian ironclads Almirante Cochrane and Blanco Encalada. Fig. 2. The Huascar after the battle..... .....Page 3367
The Naval Combat in the Pacific.....Page 3368

III. MISCELLANEOUS.—Metal Stage Curtains..... ...Page 3369
Improved Canteens for the German Army.... ....Page 3369

IV.—ELECTRICITY.—Deprez's Electric Motor. A small and highly satisfactory motor for utilizing electricity as a motive power. 1 figure..... .....Page 3372
Piercing Glass by the Electric Spark. 1 figure.....Page 3373

V. PHYSIOLOGY AND HYGIENE.—The Circulation of the Blood. Lecture by Prof. E. J. Marey. Fig. 1. The course of the blood Fig. 2. Decrease of pressure in tubes of uniform diameter. Fig. 3. Distribution of pressure in a tube of unequal diameter. Fig. 4. Metallic Reading Manometer..... .....Page 3373
Chloral Inebriety. Conditions, causes, and effects of the improper use of chloral..... .....Page 3374
A New Malarial Germ..... .....Page 3374
Catgut as a Carrier of Infection..... .....Page 3374

VI. TECHNOLOGY AND CHEMISTRY.—Liquid Extract of Ergot. By P. YVON..... .....Page 3374
On Some New Properties of the Natural Metallic Sulphides. 1 figure. Galena covered with metallic vegetation. Remarkable experiments suggesting an explanation of the mode in which beds of native silver are formed..... .....Page 3375
Fractional Distillation. The value of different methods.....Page 3375
The Accumulation of Nitric Nitrogen in the Unchanged Water of Aquaria. By H. W. JONES.....Page 3375
Nitrification. By T. SCHLOESING and A. MUNTZ.....Page 3375
Analysis of Commercial Potash. By B. CORENWINDER and G. CONTAMINE..... .....Page 3375

VII. ASTRONOMY.—The Sun. By S. P. LANGLEY. Instruments for the observation of the sun. Study of the sun's surface. Causes of sun spots. Sun spots and the weather. 9 figures .....Page 3376
Saturn. A description of saturn, etc. By T. W. WEBB.....Page 3377

VIII. NATURAL HISTORY, MICROSCOPY, ETC.—The History of the Horse Bot fly. The egg. The larvæ, etc. Illustrated. .....Page 3378
Photographs by Aid of the Microscope .....Page 3379
Yale College and American Paleontology. A description of the fossil treasures of New Haven, and the evidence they furnish of the geological history of America.....Page 3379
Biology and Microscopy. Work done in 1879 by the Biological and Microscopical Section of the Phila. Academy of Sciences.....Page 3380
Meeting of the Biological and Microscopical Section of the Academy of Sciences, Philadelphia, December 1, 1879. Dr. JAMES MCCOART'S paper on Parasitic Bronchitis in Cattle..... .....Page 3381
Rose Farming. A detailed account of rose planting for perfumery in Turkey and India.....Page 3381
Moths Entrapped by an Asclepiad (Physianthus) and Killed by Honey Bees .....Page 3382

ACTION OF SEWER GAS ON LEAD, ETC.

The sanitary inspector of Dundee, Scotland, Mr. T. Kinnear, has watched the effect of the gas on portions of the zinc eaves of buildings where it was striking on the under part, and found, in the course of a couple of years or so, pretty large holes eaten completely through, showing that material could not longer withstand the effect of the gas. Lead is, of course, more durable than zinc, but the difference is only a question of degree, as shown by the fact, in not a few of the water-closets repaired by the officers of the department during the year, small apertures were found in the main vertical lead pipe, and in the cross or horizontal one leading from it to the trap of the closet various perforations were found on the top, indicating clearly the operation of foul air from the drain. Lead traps and soil pipes from water-closets, baths, and fixed basins are all subject to wear and tear; but the traps, being burdened with the additional strain of barring the passage of sewer gas, do their work less efficiently, and for a much shorter period, than they are generally credited with, hence the necessity for proper ventilation and occasional inspection.—*English Paper.*

The Sanitary Board of this city long since made the same discovery as to the corroding effects of sewer gas as reported above.

Not long ago, under the direction of an engineer attached to our Sanitary Board, we had occasion to have a lead waste pipe leading from the third story to the cellar of our residence examined, for the purpose of detecting the source of a slight odor. This pipe connected with the main pipe, which extended to the sewer. On taking down the waste pipe, we found it in many places honeycombed, and in others it had become so thin as to be compressible between the thumb and finger. This was probably due to the presence of carbonic acid gas in the sewage, a gas which is almost always present in drain pipes. Carbonic acid gas corrodes lead very rapidly; hence the use of lead as a material for the main drain pipes of dwellings has of late years been generally abandoned, and iron pipes substituted. But even iron is not wholly free from objection, though it is considered safer than lead.

Occupants of city houses which have been built some time should not neglect to have the plumbing work in their homes examined and a remedy applied at once to any discovered defect. At this time of year diphtheria, scarlet fever, measles, and kindred diseases are most apt to prevail, and the cause may frequently be traced to defective traps, loose joints, and worn out pipes. Every pipe leading into a sewer or cesspool should be ventilated. One very common method of doing this is to run a pipe from the main or discharge pipe up through the house above the roof.

THE TYPICAL YANKEE.

In a recent speech at a society meeting in Michigan, the Hon. T. W. Palmer said that the Yankee's idea of life is business, and business with him means activity rightly directed: "Firm in intent, but flexible as to methods and fertile in resource, the typical Yankee of to-day is the man who, more than another, puts himself in accord with natural laws."

This definition admirably characterizes the typical man of the nineteenth century, regardless of race. The world over, men of this character are giving new power, a broader scope, and a breadth of freedom to life, such as the world has never dreamed of before. And if such men abound in America more than elsewhere—so much more as to justify our calling the type pre-eminently Yankee—it is simply because of the large liberty America allows from the political, social, and ecclesiastical restraints which, in other lands, keep men from developing the power there is in them.

Not only does the typical Yankee seek to put himself in accord with natural laws, but he is persistent in seeking to widen his grasp of those laws, to make his knowledge real, and to set to practical work the forces which nature puts at the service of those who know how to use them. The freest of all men from superstition, the Yankee neither fears nor reveres the unexplained; and he has as little respect for the old simply because it is old. The secrets of nature are his game; he is bound to capture them. No custom, no alleged truth is sacred in his eyes because of its antiquity. His allegiance goes with utility. If the new is better than the old, that is reason enough for embracing it. His ideal is progress; he works for it, forces it, enjoys it. His genius is universal because it is unrestrained, fearless, practical; and American life everywhere shows the power and effect of it.

A BURIED RACE IN KANSAS.

It is well known that the wrought stone implements found in the ancient river gravels of California prove conclusively that during or before the glacial period the Pacific coast was inhabited by man. In a report on recent archæological explorations in Kansas, Judge E. P. West, of that State, presents a large amount of evidence to show that at an equally remote period that region was peopled by a race compared with which the mound builders must be accounted modern.

The geology of the region is simple. Prior to the drift epoch the river channels were deeper than now, and the river valleys were lower. Subsequently the valleys were filled by a lacustrian deposit of considerable depth. In or beneath this last deposit the remains of an extinct race occur.

Such remains have been found at various depths in seven different counties along or near the Kansas Pacific Railroad, namely Douglass, Pottawatomie, Riley, Dickinson, Marion, Ellsworth, and Lincoln counties. With one exception the remains have all been found on the second bottom or terrace of streams, and consist of stone implements, pottery, human bones, and bone implements. In most cases they were struck in digging wells, at a depth of from twenty to thirty feet below the surface. In view of the fact that there is not more than one well to the square mile in the counties named, and the area of a well forms but a very small fraction of a square mile, Judge West thinks the evidence already obtained not only sufficient to prove the former existence of the buried race, but to prove that they were very numerous. We can hardly assume that chance has directed the digging of wells only where human remains are buried.

Whether the race existed before the glacial epoch or immediately after it is too early to determine. Judge West is inclined to fix their time of occupancy as after the glacial epoch and prior to the deposition of the Loess. In calling upon the local newspapers of Kansas to lay the facts before the people and urging the propriety of saving such remains when found, and noting carefully the conditions under which they occur, the judge says:

"Here we have a buried race enwrapped in a profound and startling mystery—a race whose appearance and exit in the world's drama precede stupendous geological changes marking our continent, and which perhaps required hundreds of thousands of years in their accomplishment. The prize is no less than determining when this mysterious people lived, how they lived, when they passed out of existence, and why they became extinct."

TAKING DOWN CLEOPATRA'S NEEDLE.

The *Herald's* correspondent at Alexandra, Egypt, writing December 12, reports the safe removal of Cleopatra's Needle from the pedestal which had supported it for nearly nineteen hundred years. This pedestal is of the same kind of granite as the obelisk itself, and must have been brought from the quarry at Syene, near the first cataract of the Nile. It is remarkable that the existence of this pedestal, measuring nine feet high and six feet square and weighing forty-three tons, was unknown previous to the present excavations. The obelisk was formally ceded to Commander Gorringe and Lieutenant Schweder by the Governor of Alexandria, on October 22. By the 10th of November the earth was removed to some twenty feet below the present level of the soil, and the base of the obelisk and the large pedestal resting on three marble slabs were made visible. The base of the Needle is rounded by age. It originally rested upon four bronze crabs, each about three feet long by one wide. One of these crabs was under each corner, firmly fixed to both obelisk and pedestal by two bronze bars an inch in diameter and over a foot in length. One of these bars, projecting perpendicularly from the back of the crab, is fitted into a hole in the base of the obelisk. The other bar, descending perpendicularly from the crab's belly, is fitted into a similar hole in the pedestal. Both of these bars were firmly soldered with lead.

Owing to the jamming of one of the claws with a projecting piece of the base of the pedestal much difficulty was experienced in lowering the shaft, but on the 6th the work was successfully accomplished. When overturned the obelisk rested on sections of a float, whence in due time the Needle would be shoved into the steamer intended to bring it to New York. The steamer purchased for this purpose was the Dessouk, of 1,600 tons register. The Dessouk was built in England and bought by the Egyptian Government while on the stocks. She is not fast, but is very strongly built.

The Commerce of New York.

The official record of arrivals of vessels at this port last year was 21,421, against 19,110 in 1878, and 19,536 in 1877, the increase being in the trade with foreign and eastern domestic ports. The arrivals from foreign ports were 8,077, against 7,348 in 1878, and 6,244 in 1877. The arrivals from domestic ports were 13,344, against 11,762 in 1878, and 13,112 in 1877. Of the arrivals from foreign ports, 1,591 were steamers, 1,096 being British, 188 American, 129 German, 59 Belgian, 40 French, 35 Dutch, 29 Danish, 10 Spanish, 3 Italian, and 1 Russian.

In 1878 the United States led in the number of sailing vessels from foreign ports; in 1879 Great Britain had the larger number, namely, 2,804 against 2,414 of United States register. Norway was third, with 1,139, of which 1,000 were barks. Then follow Italy with 560 vessels, Germany with 459, and Austria with 236, 216 of which are barks. Then come France, Sweden, Holland, Belgium, with 59 steamers and two other vessels; Spain, Denmark, Hayti, Portugal, Russia, Venezuela, Costa Rica, Mexico, the Argentine Republic, Nicaragua, and Brazil, in that order, the number of arrivals credited to each ranging from 82 French vessels to 1 of the last two nationalities. Two-thirds of the steamers were British; one-third of the ships American, and another third British; one-third of the barks Norwegian, one-quarter British, and one-eighth American, and another eighth Italian; nearly half the brigs were American, as were three-quarters of the schooners.

General Wool's Monument.

The largest obelisk ever quarried in the United States was recently set up in Oakwood Cemetery, near Troy, N. Y., as a monument to General John E. Wool and his wife. The obelisk is 60 feet high, weighs 100 tons, and is mounted upon a pedestal comprising three plain bases, a moulded base, a die and neck mould. The lower base, 17 feet 6 inches square and 2 feet thick. This and the two succeeding

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courses are each composed of two stones, while the fourth or moulded base, as well as each course above, is of a single stone. The total weight of the pedestal, which rests upon solid rock, is 150 tons. The weight of the entire structure is, therefore, 250 tons; the height, 75 feet 6 inches. In the curve of the mould are military emblems cut in *alto rilievo*, consisting of a field glass, the sword, scabbard, and hat of a major general, all effectively grouped. The die, 6 feet high, is 9 feet square at the bottom, tapering to 8 feet 2 inches square at the top, to correspond with the lines of the obelisk, which tapers from 5 feet 6 inches square at the base to 3 feet square at the base of the pyramid, in which it terminates, the altitude of the latter being 5 feet 6 inches. The angles and upper edges of the die, together with the neck mould, are embellished with carved Egyptian mouldings, and the four sides of the die bear inscriptions.

The stone was quarried at Vinalhaven, Fox Island, Maine, 400 miles from Troy, whence it was transported in a strongly built barge towed by a steam tug. From the dock at Troy it was moved to the cemetery on rollers by means of capstans and heavy hawsers, this part of the work requiring more time than the 400 mile sea and river voyage.

MOLES AT THE CAPE OF GOOD HOPE.

Mr. H. N. Moseley, in his Challenger notes, writing of Simons Town, South Africa, says: The sandy flats and fields about the sea shore are covered with mole hills, and bored in all directions with tunnels, large enough to admit the hand and arm easily, by the sand mole (*Bathyergus suilus*). Bathyergus is a rodent, with an excessively long pair of projecting lower gnawing teeth. It is a foot long, and covered with a light gray-brown silky fur.

There is another similar rodent mole of about half the size (*Georychus capensis*), which rather affects higher land, but occurs also sometimes with Bathyergus.

The two together are in such abundance as to cover the country in all directions with mole hills, and in galloping over the sand one is very apt to be thrown headlong by one of their galleries giving way under his horse's feet. I had two such falls in one day. A clever horse brought up in the country learns, however, while turned out on the run, to lift his foot out of a hole without stumbling.

It is the custom to call the moles, such as we have in Europe, the true moles, and to regard these rodent moles as animals which in some extraordinary way have adopted habits not proper to rodents, but natural and what is to be expected in a certain group of insectivora. But in reality, there seems to be no reason why the one set should be the *true* moles rather than the other, excepting merely as a matter of home nomenclature and prejudice. The South American rodent mole, the tucutuco (*Ctenomys*) is familiar as described by Darwin in his journal. And besides this, there are all the Spalacini, or blind moles, of which there are nine genera, including Bathyergus and Georychus, forming steps toward the ground squirrels, Geomys. Of the true moles, or insectivora, with the habits and outward shape of Bathyergus and Georychus, there are only five or six genera in all. Why should not Talpa be looked upon as the plagiarist?

There is still another very different animal, with mole-like habits, the little armadillo (*Chlamyphorus*) of the Argentine Republic. It seems remarkable that no Marsupial in Australia has become modified to suit mole-like habits. All other mammalian habits almost have been adopted by Marsupials. Bathyergus has, like our Talpa, a bare snout, and strong digging hands and feet.

It burrows of course in search of roots and vegetable food only, not for worms like Talpa. The people about Simons Town have an idea that the animals work the earth at certain stated hours, and have regular periods of rest; but I was always able, by going over a good deal of ground, to find one working at any time of the day. The heaps thrown up are huge, a foot high, five or six times as big as those of our little mole.

A fresh heap is betrayed at once by its darker color, that is, its dampness; in a few hours the dry heat of the Cape reduces it to a glistening white. One has not long to watch, standing a few yards off, before the fresh heap is seen to heave up, three or four times in succession, as the mole forces freshly scooped-out earth up with it from below.

I tried at first shooting into the heap as it was thus heaving, in the hopes of getting the mole, but never with any success.

In order to shoot the worker, the earth should be quickly thrown back from the fresh heap, and the hole laid open to the air.

One then has only to retire about ten paces and wait patiently. The mole does not like the fresh air, and in the course of five minutes or so, comes back to fill it up, but usually puts its head out for a moment first, to find out what's up, though it certainly cannot see far with its minute eyes, which are not bigger than the heads of carpet pins, the whole eye ball, when extracted, being not bigger than a tenth of an inch in diameter.

Of course a charge of shot at the moment the animal shows its head is effective. But the easiest method of getting specimens is on scraping away the earth from the fresh mound, to insert in the hole a common rabbit gin, well secured with peg and string. I trapped a good many Bathyergi in this way, and one Georychus.

Bathyergus is very fierce when dragged out of its hole, fast by one leg in a gin.

The animal bites the air savagely with its enormous teeth, which project an inch and a half from the lower jaw, and makes an angry, half snarling, half grunting noise.

I took several of the moles on board the ship alive in a sack. I let the sack swing by accident against one of my legs, and one of the moles gave me a very unpleasant nip, biting through the sack and my clothes.

When put in a strong wire cage the mole first tried to burrow, but finding that absolutely impossible, tried to bite the wires all round, and that failing, became sullen and quiet. The animal can evidently see for a short distance.

Besides these moles, which are a great pest in gardens, there is a little insectivorous mole (*Chrysochloris inauratus*), the golden mole, which is not more than half the size of our English mole, and has a dark, silky fur, shot with most brilliant metallic golden tints.

This mole makes quite superficial runs in the ground so near the surface that the earth is raised all along the run, and hence the track can be followed everywhere above ground.

When one of these is seen at work it can be thrown out with a stick or spade at once.

Progress of the Great Suspension Bridge between New York and Brooklyn.

At the last monthly meeting of the trustees of the Brooklyn Bridge the Executive Committee reported that the amount required to complete the bridge is as follows:

Estimated cost of the bridge, Feb. 1, 1879		$13,708,026.60
Expended at that date		10,103,553.54
Amount required, Feb. 1, 1879		3,604,473.06
Expended since that date up to Dec. 1, 1879	$1,006,262.04	
Cash on hand and receivable from two cities at this date	596,676.04	$1,602,938.08
Remaining to be provided for		$2,001,534.98
Add for rise in land, materials, and labor 10 per cent since Feb. 1, 1879		200,153.49
Add for contingencies		48,311 53
Grand total to be provided for		$2,250,000.00

At the same meeting the test of seven of the suspenders of the bridge in the testing machine at the U. S. Arsenal, Watertown, Mass., was reported on. The tested suspenders were chosen at random from those made for the bridge. The object of these tests was to ascertain the efficiency of the mode of securing the suspenders to the parts by which they are attached, respectively, to the main cables and to the suspended superstructure. The suspenders are attached to a wrought iron fixture at one of their ends and to a casting at the other end, by being inserted into conical sockets, 3¾ inches in diameter at the base of the cone. At the other end the diameter is just sufficient to allow the suspender to be passed through. The suspenders are secured in these sockets by spreading the wires which compose the rope, and then driving in the voids tapering pins of wrought iron; the projecting wires are turned over, and the cavities filled with lead. The tests seem to show that turning over the wires and filling the cavities with lead do not add to the strength of the fastening. The length of the tested suspenders ranged from 18 feet 9½ inches to 24 feet 3 inches. The strain to which they were subjected varied from 141,000 pounds to 194,000 pounds. In none of the tests was the full strength of the suspender ropes themselves brought out, and in no case did the suspender pull out of its socket.

The maximum stress that can be brought on any suspender from the weight of the structure alone, or the dead load, as it is termed, is 8,200 pounds, and from the movable, or rolling load, 13,125 pounds, making a total of 21,325 pounds. The mean breaking strain of the seven suspenders which were tried was a trifle over 168,000 pounds, or over seven times the strain which they will ever be required to stand. If the lowest breaking strain of the seven tests—141,000 pounds—be taken, the factor of safety will be about seven.

Facts about Gold.

In a recent lecture on gold, Professor Egleston, of the School of Mines of Columbia College, remarked that it was formerly supposed that gold was to be found only in or on the Ozoic and Paleozoic formations. When, in California, Whitney discovered it in the Jurassic, it was a revelation. It is now found in the deposits of all ages. The rock in which it lies is generally metamorphic, and therefore it is the surroundings that indicate the period. By gold we mean a yellow substance, which contains a quantity of pure gold, mixed with other substances, of which silver is almost always one. It is common to consider the quantity of gold in the world to be large. But there is only seven thousand millions worth, which is about half pure gold and half silver. The annual production is about one hundred millions worth, and the production has decreased 44 per cent during the past thirty years. The production of silver, however, has increased 100 per cent, and now equals that of gold. One third of the gold goes to wear and tear, one third goes into circulation, and one third into the arts and manufactures. All the gold in the world would make a pile only 25 feet wide, 45 feet long, and 25 feet high.

The First American Patent.

The first American patent for an invention was issued to Samuel Hopkins, at New York, July 31, 1790, for an improved process of making potash and pearlash. A recommendation to the House of Representatives to appropriate $500 for the purchase of this patent was made by Secretary Schurz, January 8. The present possessor of the document is E. T. Hale, of Columbus, Ohio. It is written on a sheet of parchment in a round, old-fashioned hand, signed by George Washington, and certified by Ed. Randolph, Attorney-General, as being conformable to the act of Congress to promote the useful arts, and its delivery to the grantee is certified by Thos. Jefferson, with the seal of the United States.

Marine Foundations.

A great deal of ingenuity has been spent by engineers in the construction of the foundations of lighthouses and other similar structures. In some of these the stones are laid in offsets to a considerable height above the rock, with the object of breaking the sea; each stone in the face is dovetailed vertically and horizontally into the adjoining stones, while a further precaution is taken by bolting each stone to the course below it by bolts of yellow metal and galvanized steel. Such a mode of construction was adopted in the Wolf Rock Lighthouse off Land's End, considered the most difficult erection of the kind on the British coast. The rock on which it was built is seventeen feet above low water. In another structure, well known, the Bishop Rock Lighthouse, which, Findlay says, is probably the most exposed lighthouse in the world, the same construction is employed, and as a rule, in most sea rock structures, massive blocks, dovetailed and doweled together, have been used A notable exception to this mode of construction was the plan devised for building the Phare d'Ar-men. The rock, Ar-men, presented formidable difficulties; it was almost impossible to obtain a secure footing, an iron structure was out of the question, on account of the difficulty of landing large pieces of iron framing; and to make matters worse, the rock was divided by deep fissures. The method resorted to was as simple as it was bold; it was decided to bore a number of holes thirty centimeters deep and one meter apart all over the site, and others outside, in order to hold ring bolts necessary for craft and to fasten lashings. In some of these holes wrought iron gudgeons were fixed for the purpose of fixing the masonry to the rock, and thus to make the construction itself serve to bind the different parts of the rock together.

In addition to these gudgeons, horizontal iron chains were introduced into the masonry courses to prevent disjunction. The gudgeons were 0·06 meter square and 1 meter long, made of galvanized iron, and the lower masonry was of small undressed stones set with Parker Medina cement. Here we find a very different principle of consolidation necessitated mainly by the difficulties of landing large materials, and also by the rock cleavage. Of course, the object of dovetailing and doweling the blocks together is not only to insure strength, but to prevent displacement of the masonry by the force of the waves during construction before the superincumbent weight of masonry could be brought to assist. In some other instances the courses of the basement are divided into a number of keystone-like parts, each of which is secured to the underlying stones by granite plugs let into the adjacent courses. Iron and screw piles have now superseded, in several cases, the solid foundations we have been describing, as in the instances of the Fowey Rocks, Ship Shoal, and other structures in the United States; but the engineer of marine works will probably sooner or later have to resort to a method of building foundations under water in which the advantages offered by the combined use of concrete and iron must be acknowledged. The government works at Dover harbor, and the harbor constructions at Douglas, in the Isle of Man, are instances in which concrete blocks of large size have been successfully employed; and the question appears to be worth a passing thought, whether or not, by the use of iron in the shape of piles or pillars, together with chain bond, smaller blocks of concrete might not be used with more economy in structures which have to withstand the force of the waves, or in places where the employment of large blocks would be attended with risk and difficulties. Blocks of Portland cement concrete might be cast or moulded into forms capable of being interlocked together in the same manner as the stones of Eddystone, the Bell, and Wolf Rock towers, and these could be secured to the rock by a system of iron uprights and horizontal bars, so that the structure may possess both vertical and lateral cohesion under the most trying circumstances.—*Building News.*

The Sun's Rays as a Means of Research.

The Photographic *News* reports that M. Raoul Pictet is about to try, on an extensive scale and experiment, having for its object the dissociation of the metalloids by means of the sun's rays By the use of a huge metallic mirror he hopes to bring such a concentration of sun rays to bear upon the metalloids as will enable him to definitely determine the truth or fallacy of the theories of Messrs Lockyer and Victor Meyer. The experiment will probably be made at Geneva, and will, by reason of its magnitude, be unique for a research of this nature.

IRON PROTECTED BY GUM.—Sheet iron covered with gum of the euphorbiacea, common and luxuriant in tropical climates, was immersed in Chatham, England, dockyard, where everything rapidly becomes foul, and when taken out was found quite clean. The gum is intensely bitter and poisonous; hence marine animals avoid it.

PAPER NEGATIVES.—The paper is covered with collodion containing an iodide, floated upon a silver bath; washed, and floated upon a tannin solution. In order to render the paper negative transparent it is dipped into a solution of castor oil thinned with alcohol.—*M. Aimé Péligry.*

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Bound volumes of the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT, for 1879, are now ready, and for sale at the office of publication. Orders are also filled by all News Agents.

NOVEL SIEVE.

The engraving shows an improvement in flour sifters recently patented by Mr. L. H. Thomas, of Reading, Mich. It may be used for sifting the flour, and after it is sifted the

IMPROVED SIEVE.

flour may conveniently be carried in it from the bag or barrel to the tray in which it is to be mixed. A series of annular projections are formed on the handle, and marked with the quantity or weight the sieve would contain when filled to that point.

The method of using the sieve is to take it by the handle and plunge it into the flour or other material to be sifted, giving it at the same time a rotary motion. The flour passes inward through the meshes of the sieve, filling it to the point desired.

NOVEL TAP FOR TIN CANS.

We give herewith an engraving of an improved tap for tin cans recently patented by Messrs. John T. Cooper and Julius Wagner, of Silver Reef, Utah Ter. The invention is shown in perspective in Fig. 1, and in section in Fig. 2, and it consists of a bell-shaped body, A, provided with a stopcock, E, and having a central spindle extending through it, carrying atone end the triangular sharp-edged head, B, and at the other end a wing nut, D, for drawing the bell-shaped body against the head of the can. The body, A, is provided with an annular packing which insures a tight joint between it and the can, and a packing ring is placed upon the spindle, B, below the nut, D.

The tap is applied to a can by projecting the triangular head some distance beyond the body, then forcing it through the can top and turning it through a quarter of a revolution, and finally drawing the body, A, tightly against the can top by turning the wing nut.

After the tap is once in place the contents of the can may at any time be drawn out through the stopcock, E.

This device is of great utility when it is desirable to use only a portion of the contents of the can at a time, as it prevents the remainder from evaporating or becoming spoiled by contact with the air. Aside from this it has the advantage of convenience, being capable of ready application to cans of any kind.

A Large Merchant Steamer.

A steamship which promises to be the largest and finest vessel in the world is now building at Barrow, England, for the Inman line. Her dimensions are to be as follows: Length of keel, 546 feet; length over all, 590 feet; breadth of beam, 52 feet; depth of hold, 38 feet 9 inches, and depth from top of deck houses to keel, 52 feet. Her measurement will be 8,300 tons, or over 2,000 tons larger than either the City of Berlin or the Arizona, and 800 tons larger than the Servia, the Cunard steamship now under construction.

The vessel will be finished in about a year, and will bear the name "City of Rome." Her engines will be of 8,500 horse power with six cylinders, three of which are high pressure and three low pressure. There will be eight boilers, heated by 48 furnaces, and a speed of over 18 knots is expected.

The City of Rome is to be built of steel, with a double bottom, and 11 bulkheads. Two longitudinal bulkheads are to be run through the engines' and boilers' space to decrease the danger of the vessel's sinking in case of collision. The top decks are to be of the best teak. The saloon and state rooms will be placed amidships, and accommodations provided for 300 first class passengers.

Was Adam a Peruvian?

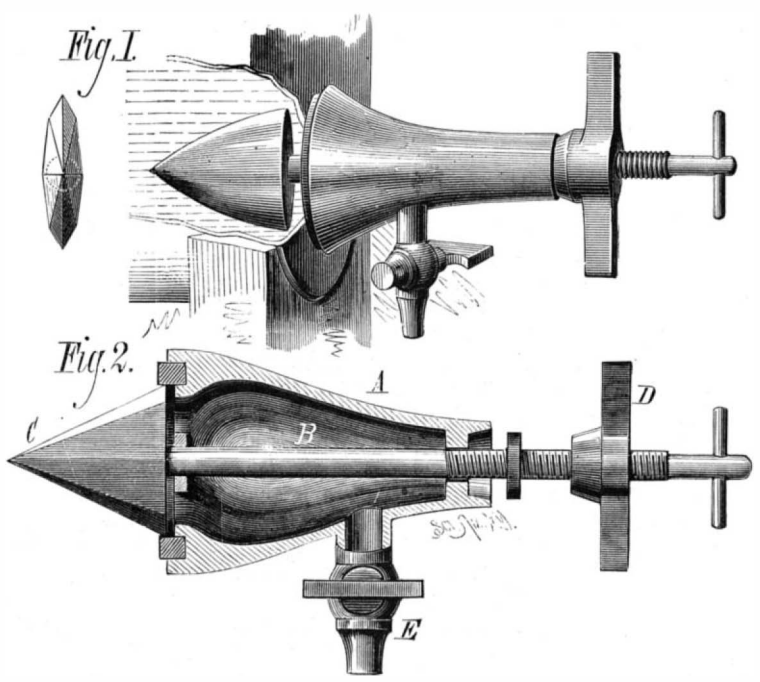
Dr Rudolf Falb, whose linguistic researches in South America have already been noticed in this paper, has lately sent to a Vienna paper a summary of his conclusions He says that the language spoken by the Indians in Peru and Bolivia, especially in Quichua and Aymara, exhibit the most astounding affinities with the Semitic languages, and particularly with the Arabic—in which tongue Dr. Falb himself has been skilled from his boyhood. Following up the lines of this discovery, Dr. Falb has found, first, a connecting link with the Aryan roots, and, second, has arrived face to face with the surprising revelation that "the Semitic roots are universally Aryan." The common stems of all the variants are found in their purest condition in Quichua and Aymara, from which fact Dr. Falb derives the conclusion that the high plains of Peru and Bolivia must be regarded as the point of exit of the present human race.

John Bright on the United States.

On returning from his visit to this country Mr. T. B. Potter, M.P., was given a demonstrative welcome by the Rochdale Reform Association. In the course of his remarks with regard to his visit, Mr. Potter said that after coming here from the commercial depression of England and its policy of imperialism he seemed to regain faith in the future of humanity and confidence in the English race. In America, if not in England, the people were untainted by the shallow doctrines of Jingoism and free from the benumbing social influences of privilege in church and state. He would advise all of them to go and take their wives with them. It was his pleasing duty to convey to Mr. John Bright the messages of affection and gratitude with which he had been charged from meetings in every part of the United States which he had visited, and the ardent hopes of all, from the President to the artisan, that "he will not die until he has seen America."

After expressing his regret that he had been and probably would be unable to visit America, Mr. Bright spoke at great length and with great eloquence upon the present condition and future prospects of the United States. Touching the size of the United States, he said:

"You know that France is considered rather a big country in Europe, but the United States would make fifteen times France, it would make fifteen times Germany, it would make twelve times Austria, and it would make twenty-five times Great Britain and Ireland. If you look at the map of the United States you will find in the extreme south a State which is called Texas. The size of the single State of Texas is 274,000 square miles. Austria is only 240,000, Germany is only 212,000, France is 204,000, the United Kingdom is



IMPROVED TIN TAP.

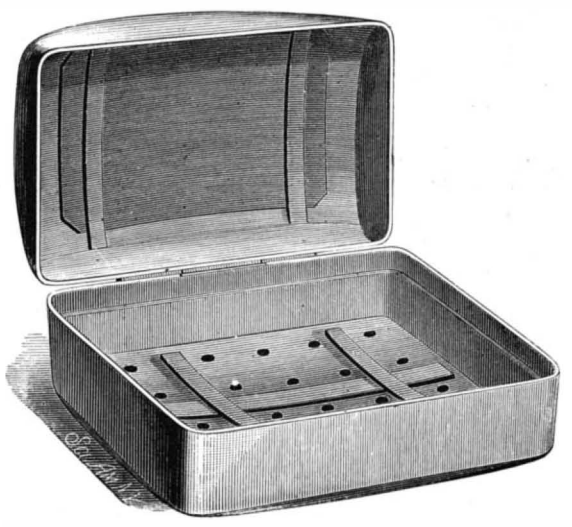
120,000. Texas can afford 2,000,000 acres of land to grow 12,000,000 bales of cotton, which is now about equal to the whole production and consumption of cotton each year over all the globe. This country that I am discussing has only been a country in a certain sense for one hundred years. A hundred years ago it consisted of thirteen small colonies dependent upon this country. Its population now has reached 50,000,000, which is about one-half more than the whole population of Great Britain and Ireland at this date, and I have no doubt but that there are scores in this room, if they live to the age to which I have attained, who will live to see the day when the population of the United States will pass in numbers 100,000,000 of people."

Coursing through the Air.

We have been written by a party who proposes to guarantee to any person of known responsibility, who wishes to take an interest in it, that he will produce a method by which he can direct his course through the air, the activity of which will be in proportion of the weight to the power used.

SOAP AND SHAVING BOX

The combined soap and shaving box shown in the accompanying engraving is the invention of Mr. Anton Hopfen, of New York city. It is composed of three main parts, the lid, the body, and the bottom. The latter is perforated to admit air, provided with cross bars to hold the soap up, and it may be pushed out or extended if required. The cross bars prevent the soap from stopping the perforations in the bottom. The cover of the box contains a piece of flexible rubber, held in place by two straps.



COMBINED SOAP AND SHAVING BOX.

This box is especially intended for travelers, and can be used as a shaving box by extending the bottom and covering the perforations with the flexible rubber.

PIGEONS BY THE MILLION.—The celebrated pigeon roost in Scott County, Indiana, is now, as it has been for seventy-five years, the roost of millions of pigeons. They fly away in the morning to their feeding grounds, many of them going to such a distance that they do not return until midnight. The timber on thousands of acres covered by this roost is broken down badly, large limbs being snapped off like reeds, by the accumulated weight of the birds. Thousands are killed nightly, but the slaughter seems to make no diminution in the vast flocks that congregate there.

A New Marble Working Machine.

The *Herald and Globe*, of Rutland, Vt., describes a new marble cutting machine, lately tried in that town, and pronounces it the most effective it has seen. The principle of the cutting tool consists in the pivoting of one or more toothed wheels or disks to an upright revolving spindle (the teeth of the wheel flush with the end of the spindle), with the axis of the wheels on a different line (in some cases at right angles) to that of the spindle. The revolutions of the spindle, with the teeth of the wheels pressing upon the material to be cut, cause the wheels to revolve so rapidly that the teeth chip the marble at the rate of sixty thousand strokes per minute. The wheels are set at various angles to the line of the spindle, depending upon the work required to be done, and as this arrangement will channel, turn, and flute a column, countersink, mould, panel, letter, and do filigree work, quite a number of different settings are required. Each spindle has about thirty-eight chisels or teeth, and revolves from 1,500 to 3,000 times a minute, thus giving the number of strokes stated above.

Power is communicated to the tool by means of a flexible shaft. The machine is said to work with astonishing rapidity and very economically.

Pig Iron Advancing.

Prices of pig iron are bounding upward again, and, according to the *Hardware Reporter*, some of the more thoughtful iron-makers are feeling uneasy. They fear that values are going to reach a point from which they will drop with a thud one of these days. It was thought some time ago that the English market would regulate ours, but this is proving a delusion, as prices there are bounding upward to as giddy a height as they are here. In other words, instead of the English market controlling ours, the reverse is the case. The cause of the whole trouble is a scarcity of ore. If all the American furnaces were in blast they could meet the enormous demand; but many of them cannot blow in for want of ore—and we notice by our late English exchanges that the same is true with many furnaces in Wales.

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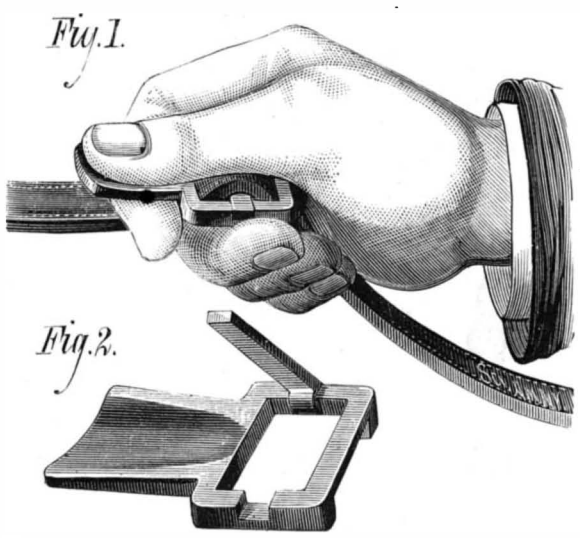
NEW HAND HOLD FOR REINS.

The novel rein holder shown in the annexed engraving is to be applied to driving reins to afford the driver a strong



POWELL'S HAND HOLD FOR REINS.

hold upon the reins without undue pressure or cramping the hands. The device consists of a buckle conveniently arranged for attachment to the reins, and having a plate projecting from one side of it to be clasped between the thumb and forefinger, as shown in Fig. 1. Fig. 2 shows the device detached from the rein. This simple holder will add greatly to the comfort of driving, as it enables the driver to hold his reins without exertion, and it is especially valuable in cases of emergency, as it affords a firm hold that is impossible with bare straps.

Further information may be obtained by addressing the inventor, Mr. Hazael B. Powell, of Napoleon, Ohio.

NOVEL VISE.

The annexed engraving represents an improved adjustable vise recently patented by Mr. Fortonato C. Zanetti, of Bryan, Texas. The vise is capable of being placed and secured in any desired position to adapt it to different kinds of work, and to hold it in a convenient position for the workman. The lower end of the fixed jaw is provided with an arm projecting backward, and having a spherical socket for receiving a ball on the end of a fixed standard. The spherical socket is made in two parts, one being an integral portion of the vise, the other being secured to it by screws, and the two parts are capable of being drawn tightly down upon the ball by a clamp screw passing through one part into the other.

In the lower end of the fixed vise jaw there is a socket for receiving a standard having a convex foot which rests on the bench which supports the vise. This standard is adjustable, and is held in place by a set screw. When the vise is set in any desired position the standard is drawn out until it bears upon the bench or table, and assists the ball and socket joint in sustaining the weight and strain of the vise and the work.

Practical mechanics who are often obliged to work at a vise in an inconvenient and uncomfortable position will appreciate the advantages of this vise.

Mystery in Mechanics.

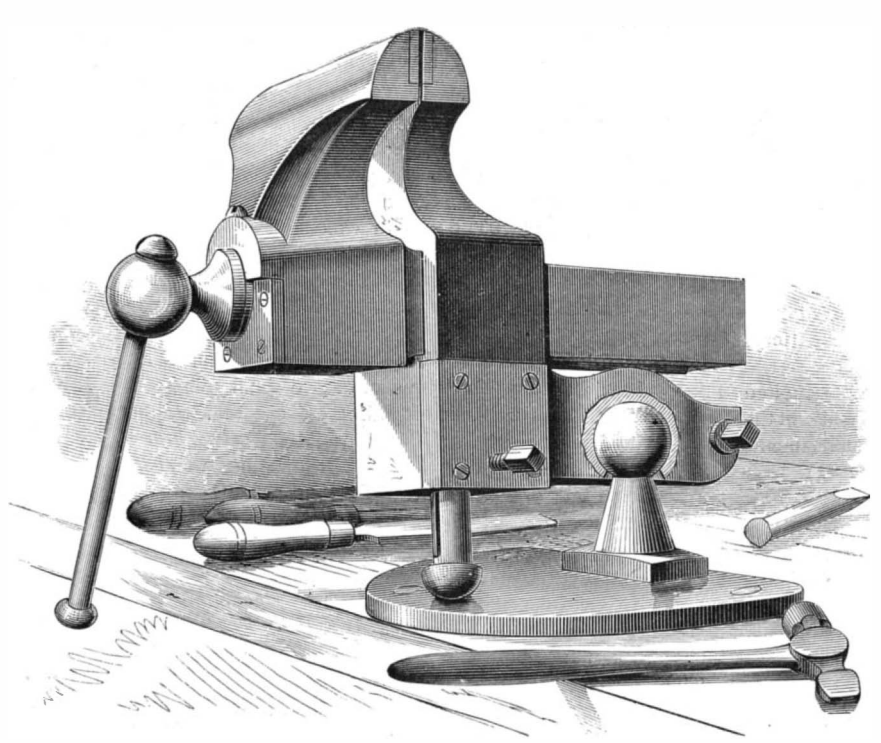
The Boston *Journal of Commerce* justly observes that there is a class of mechanics who affect great mystery about their work, and appear to imagine they can convey the impression that there is something occult or hidden in the processes they use and the materials they employ. Inventors are peculiarly sensitive about making known what they intend to do or the way they intend to do it, as though the world stood agape, ready to wonder and admire as soon as the letters patent were issued. Perpetual motion mongers are justified in keeping secret their experiments—they usually keep secret the result. But in nine cases out of ten the inventor could obtain the money assistance he requires simply by trusting his proposed improvement in detail to judicious friends, and he might with safety and advantage frequently take a brother mechanic into his confidence.

A short time ago a carpenter, in assisting to move some heavy machinery, had occasion to go into a room where the soldering of preserving cans was being done. He wanted to bore a hole through the floor through which to pass an eyebolt. He was refused admission until he solemnly promised not to notice the work which, with some handy appliances, was performed very rapidly. A visitor to a white lead manufactory was refused admission to a room where the pig lead was cast into sheets previous to being acted on by the acid. Yet there was absolutely no secret in it. The melted lead was simply thrown in small quantities on a sort of shovel of sheet iron, where it congealed to a thin film. The worsted braid used largely for the trimming of ladies' dresses a few years ago is as smooth as silk, without fuzziness, although the yarn is full of projecting fuzz. A certain company kept its process a great secret, but an examination of their braid under the microscope showed it was simply singed. Some temperers of steel profess a great secret in the preparation of their hardening pickle, a secret as patent as though described on a page.

There are very few manipulations or manufacturing processes which are truly secrets, and in many of these cases the secret consists in the quality of the material used, a material perhaps not readily obtainable otherwheres. If a secret process involves much mental calculation or expertness of handling, a chance visitor must have rare observing faculties if he can carry it away with him and reproduce it at will from his memory. The laws of the science of mechanics are open to all investigators, and what one man has learned of them may be learned by another man. It is an absurd and ridiculous pretension generally that assumes that one man knows alone what many are anxious to learn, that the finished article carries no suggestion of the processes through which it has passed, and that on one man's will and life depends the success of some important manufacture.

Singular Case of Lightning Stroke.

A paper was read at a late meeting of the Clinical Society, London, by Dr. G. Wilks, of Ashford, on a remarkable case of lighting stroke, which occurred on June 8, 1878. A farm laborer was struck by lightning while standing under a willow tree, close to the window of a shed in which his three fellow workmen had just taken shelter from a violent storm of rain. His companions found the tree partly denuded of its bark, and the patient's boots standing at its foot. The patient himself was lying on his back two yards off, and though he was fully clothed previously, he was now naked, with absolutely nothing on except part of the left arm of his flannel vest. He was conscious, but much burnt, and his leg was badly broken. The field around was strewn with fragments of the clothing; the clothes were split or torn from top to bottom, the edges of the fragments being often torn into shreds or fringes; they only showed evidences of fire where they came in contact with metal, such as his watch and the buckle of his waist belt. There were no laces in the boots. The left boot was torn and twisted into fantastic shapes, but the sole was uninjured, and there were no signs of fire upon it; the right boot had the leather much torn and the sole rent and burnt. The watch had a hole burnt through the case, and the chain was almost entirely destroyed. The stockings were split down the inner side; the hat was uninjured. The patient stated that he was struck violently on the chest and shoulders, became enveloped in a blinding light, and was hurled into the air, coming down on his back, "all of a crash," and never losing consciousness. The hair of his face was burnt, and the body was covered with burns. Down each thigh and leg was a broad crimson indurated band of burning, passing along the inner side of the knee, and ending below the left inner ankle and the right heel; a lacerated wound, with a comminuted fracture of the os calcis. The bones of the right leg were fractured, and the tibia protruded through the skin in the course of the burn. He was discharged healed twenty weeks after the occurrence. Dr. Wilks remarked on the almost complete exemption of the nervous system and on the probability that the clothes being wet acted as good conductors, and so diverted the electric current from the great nervous trunks, thus saving the man's life.

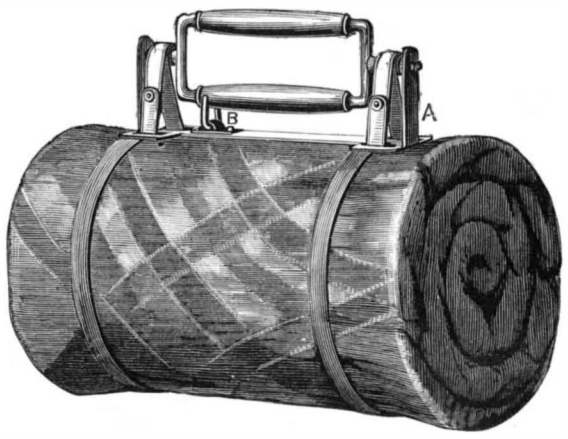


ZANETTI'S IMPROVED VISE.

IMPROVED SHAWL STRAP.

The accompanying engraving shows an improved shawl strap patented by Mr. Max Rübin, of New York city.

Two endless leather straps pass through slots in the frame, A, and through slots in the shanks of the handles. The shanks being pivoted in the frame, A, it will be seen that by



NOVEL SHAWL STRAP.

turning the handles the straps will be wound up, and will consequently bind whatever is inclosed by the straps. A catch, B, holds the handles in position after the straps are wound.

MISCELLANEOUS INVENTIONS.

Mr. James P. Bell, of Pleasant Grove, Ga., has invented an improved hame fastener, simple and inexpensive in construction; easily fastened and unfastened, and not liable to become unfastened accidentally.

An improvement in sole-edge burnishers for boots and shoes, patented by Mr. Samuel Jacobson, of St. Peter, Minn., consists of an ordinary shoemaker's burnisher, to the handle of which a spring is attached in such a manner that by means of a set screw it can be made to cover more or less of the burnishing surface, according to the thickness of the sole. The part that burnishes the upper edge of the sole is provided with a small adjustable tongue.

An improvement in sleds, patented by Mr. James H. Dennis, of Newark, N. J., consists in providing a sled frame with a hand steering device, and sweeps arranged in rowlocks.

An improved window shade attachment has been patented by Mr. Elliott Metcalf, of Findlay, O. The object of this invention is to provide a simple and effective device for suspending and opening and closing the blinds or shades known as "Venetian shades for windows."

An improved door bell has been patented by Mr. Joseph B. Richard, of Columbus, O. The improvement consists of a curved lever pivoted to the spindle of the bell knob, and which acts on a hammer that strikes the gong when the bell knob is pulled outward. The mechanism is compact, simple, and not liable to derangement.

Mr. Jesse H. Allison, of New Vienna, O., has invented an improved plaiting machine, consisting of tubular side frame, end strips, and wires, combined to form a desirable and efficient instrument.

An improvement in the manufacture of window shade cloth has been patented by Mr. Bonheim Birnbaum, of New York city. This invention relates to a new process of manufacturing decorated window shade cloth; and it is designed for producing cloth with a surface ornamented in imitation of moire antique, figured damask, watering, or any other design made by raising engraved lines on a lustrous surface.

Mr. John F. Hause, of Woodstock, Ga., has patented improvements in the construction and operation of tuyeres for blacksmiths' forges, the object of which is to procure a more perfect control of the blast, and to prevent ashes, cinders, dust, etc., from falling into the orifice of the blast pipe.

Mr. C. R. Elliott, of Golden, Col., has patented a simple and convenient device for fastening bags and sacks that may be used without sewing or otherwise permanently attaching it. This device is adapted for grain and ore bags, particu-

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larly the latter; and it consists of two or more pieces of wire or links jointed together to pass around the gathered mouth of the bag, and provided with a tongue or arm, by which the jointed ends are drawn up and locked in place.

An improvement in bob-sleighs has been patented by Mr. Gilbert Hermance, of Nassau, N. Y. The object of this invention is to so construct a sleigh with knees and beams that the runners will act entirely independent of each other, and thus insure smoothness and evenness in the running of the sleigh, and prevent straining and twisting.

An improvement in safety-pockets has been patented by Mr. Joseph Colton, of New Orleans, La. The object of this invention is to furnish an improved pocket for carrying a watch and money, so constructed that its contents may be safe from pickpockets.

Mr. Fendal D. Thurman, of Atlanta, Ga., has patented an improvement upon the harness for which letters patent were granted to him May 20, 1879, in which a rigid yoke or collar, closed at top and open at the bottom, is connected with rigid tug hooks on the shafts, and constitute, in connection with a belly band, the only parts which are necessary to gear up the horse. The improvement consists in making the collar in two pieces, connected at the top by a flexible pad and at the bottom by a strap, and combining it with loose tugs on the shaft, which are bent inwardly at their front ends, so as to take the draught strain from the center line of the collar bars, while the belly band is connected to the loose tugs in front of their pivots.

An improvement in bale ties, patented by Mr. Ira M. Camp, of Navasota, Texas, consists of a buckle or plate made in the form of the letter C, and having opposite seats in the short bend of the letter for the looped ends of the bale band, from one of which seats there extends the curved or semicircular arm, completing the C, and which serves both to contract the band with a cam and lever action when inserted, and to lock the buckle or plate by lapping over underneath, or through the looped end of the band on the opposite side.

Mr. Nelson Birdsall, of Ashland, Va., has patented an improved machine for sowing, drilling, or planting any kind of seed or fine fertilizer. The construction and operation of the machine cannot be clearly described without an engraving.

Mr. James A. Hill, of Davis Cross Roads, Ala., has patented an improved combined seed planter and fertilizer distributer, which is so constructed as to open a furrow, deposit guano or other fine fertilizer in it, cover the guano, drop cotton seed upon the covering soil, and cover the seed; which may also be used for opening a furrow, dropping small seeds into the furrow, distributing a fertilizer upon the seed, and covering it.

An improvement in fertilizer distributers and seed drills, patented by Mr. Adolphus F. Gibboney, of Belleville, Pa., relates to a force-feed formed by two meshing worm wheels having their axes in different planes, and one of them located within and the other outside of the hopper; also, to mechanism for shifting the position of the fertilizer and seed tubes or drills independently of the hopper; for the purpose of depositing the fertilizer and seed in rows at different distances apart; and to the means for throwing into or out of gear, and thus starting or stopping the mechanism for discharging the seed and fertilizer.

Mr. Byron B. Small, of North Lubec, Me., has devised an improved machine for cultivating and hoeing plants which is simple in construction, convenient and effective in operation, and which may be readily adjusted as the work to be done may require.

Mr. Warren Holden, of Philadelphia, Pa., has patented an improved drawing table, which is so constructed that the drawing paper may be adjusted to bring the part of the paper upon which the artist is at work close to him without exposing the paper to injury, and which will allow the artist to work upon long strips of paper and have the part upon which he is at work close to him at all times, while protecting the other parts of the paper from being soiled or injured.

Mr. Henry E. Hunter, of Hinsdale, N. H., has invented an improvement in combined galvanic and medicated pad, which consists in the combination of a galvanic battery, formed of plates of zinc, felt, and copper, and a medicated pad, so that a circuit of galvanic electricity may be incited by moisture absorbed from the patient's body, while at the same time the patient receives benefit from the medicaments contained in the pad.

Messrs. Louis A. Brument and Sigmund Goldberg, of New York city, have patented a portable balcony of ornamental character adapted for attachment upon a window sill for the purpose of giving an improved appearance to a house, and for use as a support for flower pots, etc The balcony may remain as a permanent fixture or be removed with facility as required.

Cattle Raising in Wyoming.

A correspondent of a Chicago paper, writing from Cheyenne, Wyoming, gives an interesting statement of the cost and profit of stock raising in that Territory. He says that a herd of 1,000 Texas cows and 40 short horn bulls cost, at a liberal estimate, $15,000. In five years the natural increase gives 5,000 head of cattle, old and young, worth not less than $70,000.

Five men, including the foreman of the ranch, are sufficient to take care of 4,000 cattle. A good foreman can command $75 per month. An ordinary herder receives $35 per month. The cost of necessary ranch buildings is trifling. The total expense of a herd of the number above mentioned for five years may be placed at $35,000, this including a contingent loss of five per cent of the cattle, leaving a net profit of $40,000 on the $15,000 invested five years before. The cattle business in Wyoming is very large and rapidly increasing. At the commencement of 1879 there were in the Territory 277,000 head, of an average value of $15 per head, making a total value of over $4,000,000. From various points in Wyoming there were shipped in 1878 some four thousand car loads of cattle, worth in Chicago $3,000,000. During 1879 a considerable advance was made in the number shipped, the larger part of the shipping being done in the last quarter of the year.

Correspondence.

Fire from Steam Pipes.

To the Editor of the Scientific American:

What tests and experiments have been made regarding the liability of woodwork being fired from contact with steam coils? I wish to learn if such experiments go to show that liabilities from fire are greater where wood is in contact with steam coils.

D. E. SMITH.

Community, Oneida, N. Y.

The following reply to the above article has been furnished us by Mr. Wm. J. Baldwin:

To the Editor of the Scientific American:

In answer to D. E. Smith, Oneida Community, N. Y., I will say fourteen years' observation has led me to the conclusion that it is utterly impossible to fire wood, or even touchpaper or tinder, with steam in pipes up to any pressure of steam at maximum density—*i. e.*, not superheated—that can be carried on any ordinarily constructed boiler.

Why do not the wooden lagging of steam engine cylinders, portable boilers, and large steam pipes on steamships, etc., take fire? or the dust that accumulates on steam coils in woodworking machine shops? Simply because the temperature of the steam pipe is not sufficiently high, and that the lowest temperature capable of doing so is between 500° and 700° Fah.

But some will hint at conditions and make use of the words "concentration of heat" and "spontaneous combustion."

Heat of this description cannot be concentrated, and is not capable of making anything hotter than itself, and spontaneous combustion has no place in our consideration, other than, if we are dealing with substances that are likely to fire spontaneously, heat will assist them, whether from steam pipes or any other source.

No one imagines they can light a stick against a boiling kettle (temperature 212°), but many will say, How would it be if I had 100 or 200 pounds of steam, it would be so much hotter then? It will be hotter. The following table shows the increase in temperature for each 100 pounds in pressure (above atmosphere) up to 400 pounds. Let them judge for themselves:

Pressure.	Temp. Fah.	Increase temp.
1 lb.	214°	
100 lb.	338°	124° 1st 100
200 lb.	388°	50° 2d "
300 lb.	422°	34° 3d "
400 lb.	448°	26° 4th "

Respectfully,

WM. J. BALDWIN, Heating Engineer.

Elmira, N. Y., January 1, 1880.

Boxwood in Russia.

Boxwood grown in the forests on the shores of the Caspian Sea is, says the *Gardener's Chronicle*, a large article of trade with Russia. This wood reaches Astrachan and Nizni-Novgorod in the spring of the year, where it is sold during the fair. Last year the quantity so sold was about 130,000 poods, being about 80,000 poods in excess of other years. It is pointed out in a recent report that the increased demand for this boxwood, which is used for shuttle-blocks, indicates increased prosperity among Russian manufacturers.

On the subject of boxwood the acting British Consul at Tiflis writes: "*Bona fide* Caucasian boxwood may be said to be commercially non-existent, almost every marketable tree having been exported. Such exorbitant terms are demanded by the government for the right of cutting in one or two remaining Abkhasian boxwood forests as virtually to bar their acquisition." He goes on to say that having personally visited these forests he is in a position to assert that their real value has been considerably exaggerated, most of the trees being either hollow or knotted from age, and much of the best wood having been felled by the Abkhasians previous to Russian occupation.

The boxwood at present exported from Rostov, and supposed to be Caucasian, comes from the Persian provinces of Mazanderan and Ghilan, on the Caspian. What has been said respecting boxwood applies equally to walnut burrs, or "loupes," for which the Caucasus was once famous, 90 per cent of which now come from Persia. The walnut trees of the forests along the Black Sea, which are extraordinarily numerous, and afford excellent material for gunstocks, do not, from some climatic peculiarity, produce burrs, which are only found in the drier climates of Georgia, Daghistan, Persia, etc. The immense quantity of walnut timber in the forests on the Black Sea is mostly unavailable from the complete absence of roads or means of transport, and the dearness and scarcity of labor.

Telegraph Wires in New York City.

An elaborate examination of the telegraphic and telephonic systems of wires in this city has been made by Mr. R. D. Radcliffe, with a view to the working out of a plan for laying the wires underground. On a large map of the city Mr. Radcliffe has made the location of every telegraph instrument in the city, whether Western Union, the Atlantic and Pacific, the Gold and Stock, the Police, the Fire Department, the Bell Telephonic, the American District, or what not, and from a study of this map he has perfected a plan for consolidating the lines of the city, which he thinks is entirely practicable. His plan is to have three great trunk lines running north and south—one through Third avenue, one through Sixth avenue, and another through Ninth avenue. From these trunk lines lead branch lines east and west through every second street, the wires being taken from the trunk lines and conducted on poles to the place desired. He does not advocate laying these branch lines underground unless there are more than twenty of them in the same street, and he does not advocate laying telephone wires underground, for the location of telephones is liable to constant changes. He finds that, under his plan, instead of 9,000 or 10,000 telegraph poles now standing, 1,500 or 1,600 poles will serve every instrument in the city in a complete and economical way.

In explaining his plan to a *Sun* reporter, Mr. Radcliffe said: "The greatest number of wires that would have to be conducted through one trunk line is 841; and they would run across Broadway, from the main building of the Western Union at Broadway and Dey street, and down John street. Of these 841 wires, 583 will go down town to the great commercial centers, and 258 go up town on the east side, decreasing in number, of course, as wires are led out to the side streets, until the trunk line reaches the Harlem bridge at 130th street with only 49 wires. The route of this trunk line would be down John to Pearl street, and thence up town, following the line of the elevated railroad. The 583 wires that run down town would be conducted by a series of underground trunks, terminating at the Produce Exchange, on Pearl and Whitehall streets, with 72 wires.

"The center and western trunk lines would start together at the main building, with 330 wires, and run down Dey to Church street, where 190 wires would turn up Church street and follow the line of the Metropolitan Elevated Road to Fifty-third street. The other 140 wires would continue down Dey to Greenwich street, and then turn up town, following the route of the west side elevated road. At Fifty-third street the center trunk line will have only 20 wires. These I would run across to the west side trunk, which at Fifty-third street will contain 57 wires. These 69 wires will then be conducted up town on the west side to 125th street, where the trunk will contain only 15 wires, which there leave the trunk and follow the line of the Hudson River Railroad north.

"Many of the wires of the west trunk leave it at Fifty-fifth street and cross the Hudson River in cables, and then go to the lines of the different railroads.

"Below John street, and on the east side of Broadway, there are more instruments than in any other part of the town, but they cannot be reached by the same system of trunk lines and branches that can be used up town. That whole territory must be covered by underground systems, and the proper disposition of the lines has given me much trouble, but I think I have solved the problem."

Touching the mileage of wires in the city and their probable increase, Mr. Radcliffe said: "My data was ascertained several months ago. There were then in this city 1,148½ miles of Western Union wires; 290⅞ miles of Atlantic and Pacific wires; the Gold and Stock Company had in their stock interest department 151 miles, and in their private line department 1,330 miles; the Bell Telephone Company, about 500 miles; American District Telegraph Company, 300 miles; Fire Department, 702 miles; Police Department, 90 miles; Law Telegraph, over 100 miles, and American Union, about 30 miles—making in all 4,662⅜ miles of telegraph wire in New York city.

"I find that the Western Union and Atlantic and Pacific Companies, the companies that do a commercial business, have not increased their mileage more than 20 per cent in the past two or three years, and that the local companies are increasing their mileage very rapidly. For instance, the American District Telegraph Company, started in 1872, has placed 300 miles of wire in seven years, and is growing an increasing ratio yearly. The Bell Telephone Company placed its first telephone in September, 1878, and at the end of another year will have added, at their present ratio of increase, 1,000 miles more to their 500 miles. The growth of the private department of the Gold and Stock Company is at the rate of 40 miles a month now. Judging from these data, I conclude that the trunk lines ought to have a capacity of 1,000 wires each to meet the demand that the increase in the telegraphic business is going to make in the coming ten years."

Samuel S. White.

In the death of Samuel S. White the dental profession loses one of its most efficient promoters, and the public at large a most respected and useful citizen. His business career has been remarkable, both for its success and its highly honorable character. Of late years Dr. White, in addition to his manufacture of artificial teeth, which he carried to the highest excellence, has given much attention to the improvement of dental machinery, implements, and furniture.

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AMERICAN INDUSTRIES.—No. 29.

THE MANUFACTURE OF REVOLVERS.

To trace the development of firearms from the invention of the ponderous and inconvenient matchlock used for the first time successfully in the battle of Pavia, in 1525, to the simple, compact, and efficient little weapon shown in the upper central figure in our engraving on the front page, would be a task of no little magnitude, as it would include not only thousands of improvements in firearms themselves, but also some of the most marvelous machinery devised by man.

Revolving pistols, or revolvers, as they are now called, were first made in their present general form in 1836, but the revolver of to-day is quite a different thing from that of forty years ago. Up to the beginning of the present century arms of all kinds were almost universally made by hand; but the want of competent skilled labor in the industrial arts of this character gave rise to a demand which resulted in the adaptation of machinery to the performance of mechanical operations, and the first quarter of this century saw the present system of arms manufacture thoroughly established, if not fully perfected and developed. To-day feats are performed by machinery that are practically impossible by hand. In the case of revolvers one piece is made entirely independent of another; they might be made in different quarters of the globe for that matter, yet when they are brought together in the assembling room they are found to be absolutely perfect. This truly American method of doing things has placed our manufacturers of firearms far in advance of any of a similar character in the world.

The establishment illustrated by the large engraving in our front page is a representative of its class, being one of the oldest, most perfect, and widely known in the country.

Mr. D. B. Wesson, the present proprietor, has been making pistols ever since he was a boy. As far back as 1849 he began their manufacture on a small scale in Grafton, Mass. Afterward he was superintendent of the Leonard Pistol Factory, at Charlestown. Next, in partnership with Mr. Horace Smith, he established the nucleus of the present large concern at Norwich, Conn., whence they moved to Springfield in 1856; Mr. Smith retired in 1874, and Mr. Wesson has since conducted the business alone, still retaining the old firm name, Smith & Wesson.

The establishment consists of buildings on a quadrangle about 200 feet square, the main structure, four stories high, occupying two sides, the forges and other shops the rest. These buildings are filled with very costly and elaborate machinery of the most perfect kind. The establishment gives employment to about 500 workmen, and has a capacity of producing 400 finished pistols each day.

The Smith & Wesson revolvers are known in every State of the Union, and have reached large sales in every country of Europe, as well as in parts of Asia and South America.

The last large order from foreign governments was from Russia for about 150,000 weapons. One fact which served to bring their arms into notice was, that the manufacturers were the patentees of the metallic cartridge, the first in the world to be used in breech-loading. This feature gave that class of arms a great preference over others in the market, and led to a large demand for them in our late civil war.

These revolvers are made with the greatest care and of the very best materials. All the parts except the stock are composed of fine steel; and they are interchangeable, so that if by any accident a part should be broken, it can be replaced with little expense and without the necessity of sending the weapon to the factory for repairs. The characteristics upon which the reputation of these revolvers is based are simplicity of construction, durability, convenience in loading, force, accuracy, and rapidity in firing.

The latest improvements are combined in the three new models, "32," "38," and No. 3 (shown in the engraving), and which now form the styles of manufacture. These new patterns are central fire, reduced in number of parts, simplified in construction, and arranged so that they may be readily taken apart for cleaning without the use of the screw-driver. In two important particulars these new weapons seem to possess great advantage. These are the "patent automatic ejector," by means of which, through the action of a cam, all of the shells are forced out of the cylinder after using, and the "rebounding lock," a feature found of vast service in the shotgun, but never before applied to the revolver. Revolvers are especially liable to premature discharge, caused by a chance blow upon the hammer when resting upon the head of the cartridge. The rebounding lock is a sure preventive of this class of accidents, being so arranged as to always hold the hammer in a safety catch, away from the cartridge head, except when purposely fired. This is an improvement of great value, as it enables the loaded weapon to be carried and handled with perfect safety.

One of the principal operations in the manufacture of revolvers is drop forging. The frames which receive the stock and contain the lock are made by this process, which is represented in one of the upper views in our engraving. The plates of Bessemer steel used for the frames are first cut into pieces of the required size and form, then heated in furnaces and passed to the pressmen, who place them under the heavy drop hammers, which with a single blow give the steel the required form.

From the forges the parts pass to the milling room, where the steel is given its perfect form by that most indispensable tool—the milling machine. The sides and edges receive their shape at the hands of different workmen, who use machines differing only in their cutters. When the piece is finished by the milling machine it is complete so far as its shape and dimensions are concerned. A clear idea of the appearance of the milling department may be had from our excellent engraving.

In this department the barrels are drilled, and in one of the rooms represented in the lower part of the engraving they are placed in the rifling machines which form the spiral that gives to the bullet its rotary motion. In these machines the twist is imparted to the tool by a rack moved vertically by an inclined guide, and rotating a pinion on the tool carrier alternately in opposite directions as the tool advances and recedes. This machine does its work as if it were possessed of brain and muscle, but unlike animate machines it is constant and regular in its operation, a marvel of mechanical skill. Most of the machinery used in this establishment is designed and used for special purposes, and is as perfect as human ingenuity can make it.

In one of the upper views is represented the stocking room, where the stocks are fitted and shaped. The machines shown in the foreground are employed in making the small diagonal grooves which cross each other, forming the roughened or checked stock seen in the detail view of the revolver No. 3.

One of the lower views shows the fitting and assembling room, where the proof of perfect workmanship is found, as all of the parts coming from different portions of the great establishment are brought here to be put together to form a complete revolver. If any part has been slighted, or is in any way imperfect, it is made manifest here, and any such part is rejected.

The revolvers are blued or plated, finished with pearl, ivory, or rubber, either with or without the extension stock. Government officials and dealers in firearms in every part of the world will be furnished with full particulars and price list, by addressing Smith & Wesson, Springfield, Mass., or to the agent in New York city, M. W. Robinson, office 79 Chambers street.

Progress of Electric Lighting in London.

A further extension of the Jablochkoff system of electric lighting has recently been made from the central station at Charing Cross on the Thames Embankment. It will be remembered that rather more than twelve months ago, says *Engineering*, that part of the Embankment between Westminster and Waterloo Bridges was lighted by 20 Jablochkoff lamps supplied by two Gramme machines, the motive power being one of Messrs. Ransomes, Sims, and Head's portable engines of 20 nominal horse power. After some months, an extension was made to Blackfriars Bridge, the number of lamps being increased to 40, and still more recently Waterloo Bridge was illuminated by ten lamps, which with five others fitted up in the board room of the Board of Works, made the total number of lamps driven from the center of Charing Cross no less than 55. and the length of conducting wires of over 18 miles. The latest addition was made on December 15, on the afternoon of which day ten lamps which had been fitted up in the Victoria Station of the Metropolitan Railway were lighted. The space illuminated is 300 feet long, 50 feet wide, and 40 feet high. The ten lights are distributed as follows: Over the down platform there are five lamps placed at equal distances apart; over the up platform there are four alternating with them, and there is one placed centrally against the bridge crossing the station; all of these lamps are placed at a height of 13 feet above the ground. The arrangement of the lamps is the same as that employed on the Embankment, and the candles are inclosed in opal globes 16 inches in diameter. The ten lights are worked on the two spare circuits of the machines employed for illuminating Waterloo Bridge. In brilliancy and steadiness the light within the station leaves little to be desired, although the pulsations and changes of color, which hitherto have been inseparable from the system, are apparent here as elsewhere. Of course any comparison between the effect produced by these ten lamps, and the ordinary gas-lighting of the station, is impossible, and the fog which has been prevalent since the experiment began seems rather to diffuse than to obscure the light. This is the first occasion, in connection with the Embankment experiment, that the system has been seen to its full advantage. On the Embankment and Waterloo Bridge a very large proportion of the light produced is lost by dispersion, but within the Victoria Station almost the whole of it is utilized.

One feature of remarkable interest connected with these protracted trials is that the distance through which the current is transmitted appears to affect but little either the power required to produce the light or its brilliancy. The engine at Charing Cross is now supplying power for sixty lights, and does not appear to be approaching the limits of its actual power. Indeed, a fourth battery of 20-light Gramme machines is now being put up at the center station, and will be in operation shortly, so that the engine will then be working 80 lights, and still a further addition is contemplated. With regard to the length of circuits, the distance from Charing Cross Station to Victoria Station is 2,383 yards, and the length of wire and connections is 1·65 mile, which may be taken as the radius of a circle within which it has been shown to be easy to supply the currents from one center; this must not be assumed, however, to represent the limit, and the experiment will shortly be made of lighting the Sloane Square Station of the Metropolitan District Railway. The wires for this last instalatilon are similar to those used on the Thames Embankment, namely, a cable of seven strands of copper wire of 19 B. W. G. This cable is fixed along the side of the tunnel, and, as above stated, its length is 1·65 mile, making the whole circuit 3·30 miles long. The Société Générale d'Electricité, acting through their engineer, Mr. J. A. Berly, deserve much credit for the enterprise and ability shown in conducting these prolonged and constantly extending experiments, inaugurated by the Metropolitan Board of Works.

Iron Bridges of Long Spans.

Speaking of the recent unexplained bridge disasters, a St. Louis contemporary remarks that half a century ago such spans as the fallen ones of the St. Charles and Tay bridges, for such loads as they were calculated to support, were impossible. Now they are far from being of the first magnitude. There are ten truss bridges across the Mississippi above St. Louis, which are not regarded as very wonderful structures, and yet seven of them have spans as long as those of the Tay bridge. The bridges at Winona, La Crosse, Dubuque, Keokuk, and Hannibal have spans of 240, that at Rock Island of 250, and that of Louisiana of 256 feet. The span which gave way at St. Charles was 320 feet in length, yet the same bridge has two spans 406 feet long. Over the same river is a truss bridge, at Leavenworth, with three spans 340 feet, and another at Glasgow with five of 315 feet.

Across the Ohio there is a truss bridge at Steubenville with a span of 320 feet, one at Parkersburg of 350, one at Cincinnati with a span of 515 feet, the longest truss yet built, and one at Louisville with a span of 400 feet. The truss bridge over the Kentucky river, on the Cincinnati and Southern Railroad, has three spans 375 feet in length, resting on iron piers 175 feet high. The bridge over the Hudson at Poughkeepsie has five spans of 500 feet, with piers 135 feet above high water. In Europe there is a truss bridge over the Vistula at Graudenz with twelve spans of 300 feet. The truss bridge of Lessart, in France, has a span of 314 feet, and was pushed across from one abutment to the other after being put together. The bridge over the Rhine at Wesel has four spans of 313 feet. The Kulenburg bridge in Holland, which was the monarch truss before the construction of the Cincinnati bridge, has a span of 492 feet.

From these examples it would seem that the St. Charles and Tay bridges, instead of being risky engineering ventures, are entirely within the domain of experience. But nevertheless the fact remains that, notwithstanding the boldness with which the engineers of the present day meet the exactions of the locomotive, they are comparatively novices in the use of iron. The first iron bridges were of cast iron, and soon proved to be too lightly proportioned. The first suspension bridges were similarly defective. Does it remain to be proved that the wrought iron work of the past twenty years betrays too great a confidence in the material? Were the St. Charles and Tay disasters unaccountable accidents, or were they fair tests of current engineering theories? These are questions which engineers would do well to discuss.

Presence of Mind.

Many railroad accidents are prevented by a presence of mind on the part of engineers. The *Car Builder* relates the following as among the recent evidences of presence of mind on the part of locomotive engineers:

A passenger train on the C. B. & Q. road was rounding a sharp curve, just under a piece of tall timber. The watchful engineer saw a tree lying across the track 60 feet ahead of the locomotive. The train was running at a rate of 35 miles an hour, and to check its momentum before reaching the obstruction was out of the question The engineer took in the situation at a glance. He threw the throttle wide open, the engine shot ahead with the velocity of an arrow, and with such tremendous force that the tree was picked up by the cow-catcher and flung from the track as if it had been a willow withe. A man with not so cool a head would have made the best possible use of those 60 feet in the way of checking the speed of the train. That would have caused a disaster. Bradford, an engineer, was bringing an express train over the Kankakee line from Indianapolis. As the engine shot out from the deep cut and struck a short piece of straight track leading to a bridge, a herd of colts was discovered running down the road. The distance to the river was only 100 feet. Bradford knew he could not stop the train, and also knew that if the colts beat the locomotive to the bridge they would fall between the timbers, and the obstruction would throw the train off, and probably result in a frightful loss of life. It took him only half a second to think of all this. The other half was utilized in giving his engine such a quantity of steam that it covered that 100 feet of track in about the same time that a bolt of lightning would travel from the tip of a lightning rod to the ground. The colts were struck and hurled down the embankment just as they were entering the bridge.

Motions of the Ground.

It will be remembered that M. Plantamour directed attention some time since to certain displacements of the bubble in a fixed spirit level, indicating movements of the ground. He has now made a year's observations of these phenomena in a cellar at Secheron, with two spirit levels, one directed north and south, the other east and west. The result is the manifestation of periodic movements of rise and sinking of the ground, which, in a general way, appear to be deter mined by the exterior temperature. After that the configuration, and, perhaps, also the nature of the ground, probably affect the intensity of the movements.

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AGRICULTURAL INVENTIONS.

Mr. Herman E. Wisner, of Howell, Mich., has invented a combined jointer and colter, constructed so that it may be attached to the plow beam with as much facility as an ordinary cutter, so that the edge of the furrow slice may be turned over, and the roots, vines, etc., cut off in front of the plow at the same time.

An improvement in grain-drills has been patented by Mr. Mads G. Madson, of Oslo, Wisconsin. The invention consists in combining with the feed wheel a seed cup having a hinged part provided with a recessed projection and lip, and in combining with a chain beam and pinion on the shaft beam a segmental ratchet lever fulcrumed on the side plate.

An improvement in sulky plows has been patented by Mr William J. Meharry, of State Line, Indiana (Sheldon, Illinois, P.O.). The object of this invention is to furnish an improved sulky attachment for plows which shall be simple in construction, may be readily attached to any ordinary plow, will materially lighten the draught, and will allow the plow to be readily controlled.

Ancient Petroleum.

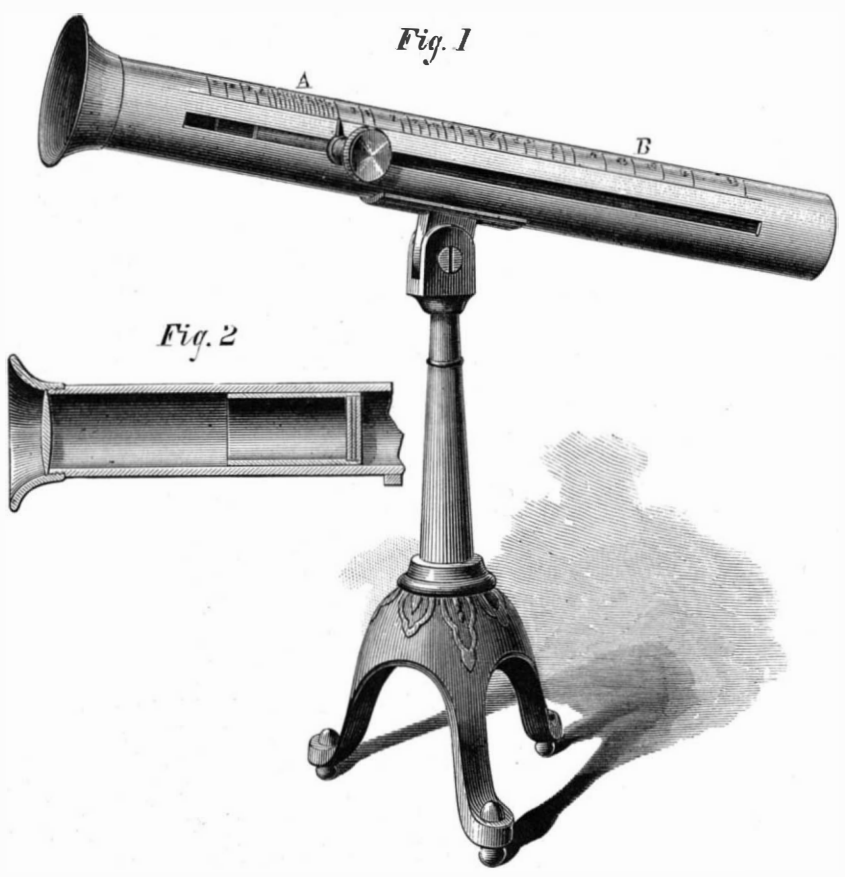
Professor Skeat has printed in the *Athenæum* a passage from North's translation of "Plutarch's Lives" (1631, p. 702), from which it appears that petroleum was known in the time of Alexander the Great. The passage runs as follows: "For a Macedonian called Proxenus, that had charge of the kings cariage [baggage], as he digged in a certaine place by the riuer of Oxus, to set vp the kings tent and his lodging, he found a certain fat and oily veine, which after they had drawn out the first, there came out also another clearer, which differed nothing, neither in smell, tast, or savour from natural oile, having the glosse and fatness so like, as there could be discerned no difference between them the which was so much the more to be wondered at, because in all that country there were no oliues."

Benzoate of Soda for Diphtheria.

Professor Klebs, of Prague, announces that the benzoate of soda is the best antiseptic in all infectious diseases. It acts, as the experiments of the author show, very powerfully. It is claimed that a daily dose of from 30 to 50 grammes to a full grown man will render the poison of diphtheria inoperative. The benzoate is prepared by dissolving crystallized benzoic acid in water, nentralizing at a slight heat with a solution of caustic soda, drying, and then allowing the solution to crystallize over sulphuric acid under a bell glass. Large doses do not appear to be absolutely necessary. Good results may be obtained by the daily administration of about 12 grammes.

NEW OPTOMETER.

The accompanying engraving represents an improved optometer recently patented by Messrs. E. G. Klein & J. X. Giering, of Rochester, N. Y. The instrument is designed to be used by opticians in ascertaining the limit of distinct vision, so that spectacles may be properly adapted to the eye. The device consists of a tube mounted adjustably on a standard, and having in one end a double convex lens, through which may be seen a translucent disk having a number of small dots printed on it. This disk is carried by a slide which is movable in the tube, and carries an index extending through a slot in the side tube and upward over a scale formed upon the upper surface of the tube. The graduations of this scale extend from a zero point toward A, for near-sighted tests, and from the same point toward B, for long-sighted tests. The number of the graduations correspond to the focal lengths of the different glasses, and when the dots on the disk are seen distinctly the index points to a number on the scale indicating the number of the glass adapted to the particular eye under test. The general appearance of the instrument is represented in Fig. 1, and the details of the lens and slide are shown in Fig. 2, which is a longitudinal section.



IMPROVED OPTOMETER.

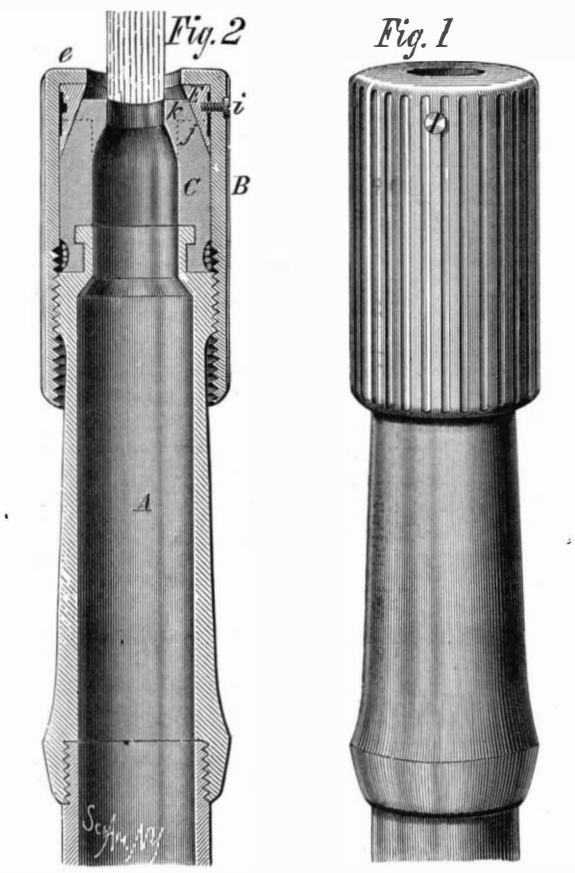
Sunlight in Norway.

At Christiana, at the summer solstice, the sun remains below the horizon only 5h. 17m.; at Trondhjem, 3h. 34m. At Bodöe, the chief town in Nordland, the sun does not descend below the horizon from the 2d June till the 11th July; at Tromsöe, from the 20th May to the 24th July; at Hammerfest, the chief town of Finmark, from the 15th May to the 29th July. On the other hand, the center of the sun does not appear above the horizon at Bodöe from the 14th to the 28th December; at Tromsöe, from the 25th November till the 16th January; and at Hammerfest, from the 20th November to the 21st January.

It is not surprising that barley, potatoes, and many other plants and vegetables ripen in the most northern latitudes, seeing they are exposed to a considerable amount of heat during two or three months of the year. In those regions where the sun hardly descends below the horizon in summer, there is no night, only a short twilight; the growing plant, therefore, enjoys permanently, and without interruption, the heat and light which it requires.

NEW ADJUSTABLE HOSE NOZZLE.

We give herewith an engraving of an improved adjustable hose nozzle recently patented by Mr. George C. Palmer, of Rochester, N. H. This is similar to a nozzle devised by the same inventor and described not long since in these columns;



PALMER'S ADJUSTABLE HOSE NOZZLE.

but the present device is more perfect and better adapted to its work. Fig. 1 is a perspective view of the improved nozzle, and Fig. 2 is a longitudinal section showing the internal construction.

The tube, A, is threaded externally to receive the screw cap, B, and it is grooved around the end to receive the elastic bushing, C, which is secured to it by a wrapping of wire. The cap, B, contains a conical metallic washer, E, which is grooved circumferentially and held in place by a screw, *i*. The shape of the outer end of the rubber bushing before compression is shown at *j* in dotted lines, and the form it assumes when the conical washer, E, is forced down upon it is shown at *k*. The nozzle is easily adjusted to any required size under high or low pressure, and it throws a smooth and uniform stream.

We are informed that this nozzle has been thoroughly tested by experienced firemen and pronounced a great improvement. It is found that a stream may readily be varied in size within wide limits, and that although the stream may be reduced in size very quickly, no sudden strain is thrown upon the hose to burst it, the operation of closing the flexible bushing being gradual.

For further information address **Mr. George C. Palmer, P. O. Box 87, Rochester, N. H.**

Arctic Navigation.

Prof. Nordenskjöld writes that, although unable to give a decided opinion at present, he thinks a voyage along the northern coast of Siberia, from the Atlantic to the Pacific Ocean, might often be performed hy a steamer specially fitted out, and manned by an experienced crew; and that such a voyage would occupy only a few weeks. The condition of the Arctic Sea, so far as hitherto explored, would, however, deprive this route of any commercial value. He has no nesitation in affirming that the trade route from Europe to the Obi and Yenisei may be regularly adopted for commercial purposes. In all probability the route between the Yenisei and the Lena may be considered open to navigation; but a return voyage between Europe and the Lena could scarcely be accomplished in the course of summer. Prolonged explorations will still be necessary before the question as to the possibility of communication by means of sailing vessels between the mouths of the Lena and the Pacific Ocean is finally determined.

Starch Photo. Process.

In consequence of the remarkable results obtained by gelatine and silver bromide, experimentalists have been induced to try starch and gum emulsions, and the latest contribution to this branch of photography is a formula for a starch emulsion by Senors Pauli and Ferran, of Barcelona. Take 4 grammes of potato starch and mix to a creamy consistency with 20 grammes of water; then add slowly 80 c.c. of boiling water, and, while the fluid is still hot, 1·12 grammes of bromide of potassium and 1·62 grammes of silver nitrate dissolved in 20 c c. of water It is recommended to add a little gelatine to the starch, in order to lessen the solubility.

MECHANICAL INVENTIONS.

Mr. Theodore E. Button, of Waterford, N. Y., has patented an improved feed-water regulator having a chamber of suitable size and shape located above the water line of the boiler, and connected with it by a pipe entering at the water line. This pipe must be large enough to allow steam and water to pass each other in it. The chamber may, however, be connected with the boiler by two pipes, one leading from the top of the chamber to the surface of the water in the boiler, and the other from the bottom of the chamber to any point in the boiler below the surface of the water. The chamber contains a float having a limited motion vertically, and connected with any device the motion of which will control the admission of water to the boiler.

An improvement in car axles, patented by Mr. Samuel D. Webster, of Cañon City, Col., consists in combining with the bearings, cap plates, oil cups, stop pins, and spring catches, the object being to prevent accidents from the breakage of axles.

Mr. Pedro Sanchez, of Tabasco, Mexico, has patented an improved machine for cleaning and extracting fibers. The main features of this invention are its springs, by which the concave chute is urged toward the revolving wheel, the stop screws, and the adjustable collar, by which this motion of the chute is limited.

Messrs. Edward L. Bartlett, of Olean, and Mowbry O. Evans, of Portville, N. Y., have patented an improved log boring machine for boring logs for pumps and various other uses. It consists of a combination of mechanism that cannot be described without engravings.

An improvement in mining drills has been patented by Messrs. Charles F. Wilkinson, L. Sandidge Allison, Peter Riley, and Ario Mochamer, of Hazleton, Pa. This drill is especially adapted to the use of miners for prospecting, also to the use of coal miners.

Mr. Henry D. Sprague, of Providence, R.I., has patented an improved railroad switch, which is designed to prevent trains from running off the track through a misplaced switch. It consists of a combination of springs and the three pairs of switch rails and their connecting bars. The construction is such that a train from the main track will pass along the switch rails to either of two side tracks, according as the switch may be adjusted, and cannot get off the track, as the switch rails are always connected with one or the other of the tracks.

Mr. Ira Robbins, of Camden, N. J., has patented an improvement in the class of presses having a horizontally reciprocating platen, and is intended and adapted for printing cards. The blank cards are fed successively downward by pushers, which slide vertically in guideways, and are received by a device combining the functions of tympan and platen, and are by it carried horizontally forward against the form to receive the impression, and then backward, and are discharged downward.

Mr. Angus McKellar, of Camp Douglas, near Salt Lake City, Utah Territory, has patented an improvement in vehicle wheel hubs. The object of the invention is to provide an improved vehicle wheel hub of the class in which the axle box is provided with a fixed radial flange, and the spoke tenons are confined between such flange and another which forms an integral part of a detachable sleeve that is screwed on or otherwise secured to the axle box.

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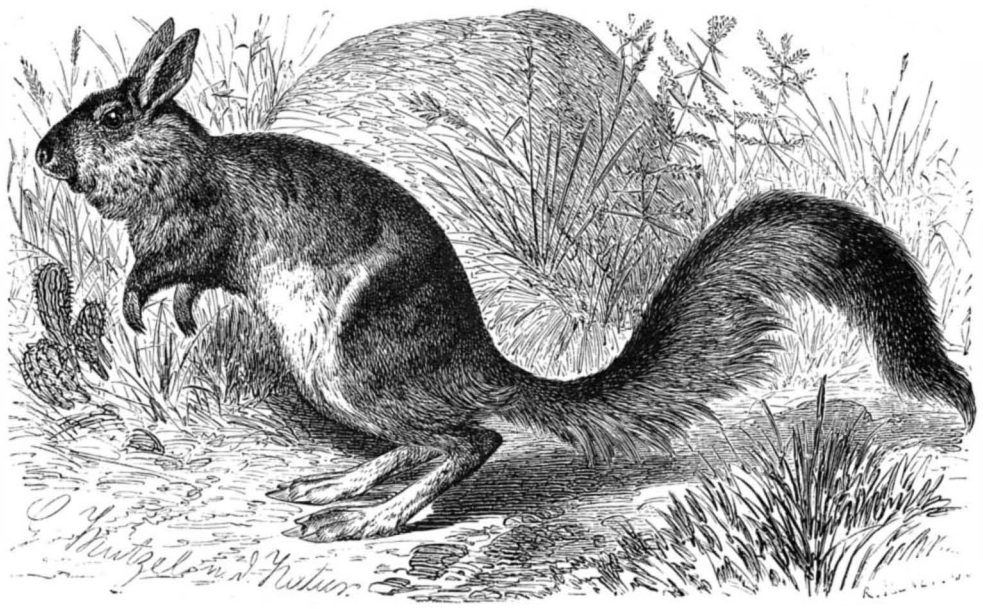
THE SPRING HAAS.

One of the most familiar of leaping rodents is the spring haas, of Cape Gerboa, sometimes called, from its hare-like aspect, the Cape leaping hare. It is a native of Southern Africa, and is found in considerable numbers upon the sides of mountains, where it inhabits certain burrows which it tunnels for itself in the ground. It prefers sandy ground for the locality of its habitation, and associates together in great profusion in favorable spots, so that the earth is completely honeycombed with its burrows. Being a nocturnal animal, it is rarely seen by daylight, seldom leaving its stronghold as long as the sun is above the horizon. The natives, who set some value on its flesh, take advantage of this habit, and being sure of finding the spring haas at home during the daytime, take their measures accordingly. Placing a sentinel at the mouth of the burrow, they force the inmate to evacuate the premises by pouring a deluge of water into the hole, and as it rushes into the open air it is seized or struck down by the ready hand of the sentinel.

Like the kangaroos, the spring haas prefers rough and rocky ground to a smooth soil, and displays such wonderful agility as it leaps from spot to spot, that it can baffle almost any foe by its mere power of jumping. At a single leap this creature will compass a space of twenty or thirty feet, and is able to continue these extraordinary bounds for a great distance. It is rather a mischievous animal, as, like the common hare, it is in the habit of making nocturnal raids upon the corn fields and gardens, and escaping safely to its subterranean burrow before the sunrise.

With the exception of shorter ears and the elongated hinder limbs, the spring haas is not unlike our common hare. The fur is of a dark fawn, or reddish-brown, perceptibly tinged with yellow on the upper parts, and fading into grayish white beneath. In texture it is very similar to that of the hare. The tail is about as long as the body, and is heavily covered with rather stiff hairs, which, at the extremity, are of a deep black hue. Upon the fore legs there are five toes, which are armed with powerful claws, by means of which the animal digs its burrows, while the hinder feet are only furnished with four toes, each of which is tipped with a long and rather sharply pointed claw.



SPRING HAAS.—*Helamys Capensis.*

CHINESE VASE.

Our engraving represents an example of opaque *cloisonné* enameling on metal for which the Chinese have a world-wide reputation. Some of the finer pieces of the ware are valued at several thousand dollars. One of the most elegant of these vases is shown in our illustration.

This vase measures some five feet in height by three feet in breadth. Its prevailing color is sea green, but other colors, such as blue, yellow, and red, appear upon its surface, and the birds, which are marvels of workmanship, have the color of their plumage copied after nature.

The engraving excellently illustrates the exceeding delicacy of the ornamentation, but it is necessary to understand something of the laborious processes by which this effect was produced in order to appreciate its great value.

Enameling, in its broadest sense, is the act of fixing a vitreous substance on any surface by fusion; usually that surface is a metal. Enamels are either transparent or opaque, and are colored by metallic oxides. The processes by which it is embedded upon or in the metal give the names *cloisonné* and *champlevé.*

There are other processes of enameling, but it is needless to speak of them in this connection. In *cloisonné* enameling the pattern is formed by slender strips of metal being bent into required shape, and fixed to the plate. Into the *cells* (whence the name) thus formed, the workman pours his enamel paste, and the piece is placed in the furnace for fusion. When the process is completed, the article is taken out, cooled, and the surface rubbed down and polished.

In the *champlevé* process, the spaces for the enamel are dug out with a tool, the raised line of the design thus being a part of the plate itself. The vitreous matter is then introduced into these cavities, the other process being similar to those pursued in preparing the *cloisonné* enamels.

CHINESE VASE.—*Cloisonné Enamel.*

The Frog Poison of Colombia.

M. André, who was sent to South America on a scientific mission by the French government in 1875, communicates an article to *La Nature* on the subject of a poisonous frog met with in Colombia, and from this we copy the following notes:

This batrachian—called by the Indians of the Choco, "Neaara"—although harmless in appearance, carries one of the most terrible poisons known. It is used for poisoning arrows, and serves the Choco Indians as a substitute for the famous *curari* employed by the savages of the Orinoco and Brazil. The three principal tribes which inhabit the immense forests of the Choco are the Cunas, the Noanamas, and the Chocoes.

Great rivers, such as the Atrato and San Juan, water these vast solitudes where the jaguar, the tapir, immense boas, and the caymans make their quarters, disturbed only now and then by the Indians who come to hunt them. For many ages this hunting has been done by means of a weapon called the "sarbacane" or "bodoquera"—a tube about 10 feet long made of the two halves of a palm stalk, which is split, scooped out, and put together again, and then wound with fibers and covered with a black, hard-drying gum. The arrows are made of small bamboo rods, which are very slender and about the length of a knitting needle. They are sharpened at one end, wound around with wild cotton at the other so as to make them just fit the diameter of the tube, and are shot out of the blow-gun with great force by the breath of the hunter. The point of these arrows is dipped in a subtile poison which is nothing else than the venom of the frog just mentioned. To obtain the poison for their weapons the Indians go in search of the little batrachian to the district of Rio Tatama, an affluent of the San Juan. The agility of the animals renders them difficult of capture, and as this has to be effected by hand, the latter is always covered with large leaves to prevent its coming in contact with the poison. Once taken, the frog is inclosed in a piece of bamboo and carried to the camp, where a long pointed stick is thrust down through its mouth and out through the extremity of its body. A fire having been lighted the spitted animal is turned round over the glowing embers until at length its skin begins to swell, and a yellowish acrid juice exudes, and into this are dipped the arrows to be poisoned. Sometimes the poison is obtained on a larger scale by scraping the juice from the body into an earthen pot by means of a knife, and this is afterwards fastened to the hunter's girdle alongside of his quiver and used as wanted. The venom, which is only used before its solidification, keeps for some time, but at length acquires the consistency of curari. The physiological effects of this poison are quite similar to those produced by curari. Introduced into the stomach the substance has no effect, but once introduced into the circulation it causes a momentary paralysis, but one which lasts long enough to kill the animal wounded by a poisoned arrow. A single arrow shot into a roebuck thoroughly disables it in ten minutes, and it takes only double that length of time to kill a full grown jaguar. No antidote is known for the poison, and the Indians are so thoroughly aware of this fact that when one has the misfortune to wound himself with an arrow he lies down quietly to await death without making any efforts to cure himself. The Choco frog belongs to the genus *Phyllobates* erected by Bibron and Dumeril. It is probably only a variety of *P. bicolor Bibr.*, which is an inhabitant of trees in Cuba, while the Choco variety is terrestrial. It would be interesting to make experiments on other species of allied batrachians found in the warmer regions of the globe; for, just as the venom of serpents differs considerably according to the species, so the cutaneous secretion derived from batrachians by artificial means may vary in its composition and in the toxic effects which result from its introduction into the circulation.

Carrier Pigeons at Great Altitudes.

Experiments were recently made in Switzerland to ascertain whether carrier pigeons would start at great altitudes, and would find their way from summits covered with snow as well as from less heights. Two pigeons were set at liberty on the Bergli, at a height of 8,600 feet. After perching for a few minutes on a neighboring rock, they took flight in the direction of the Eiger; but soon after they returned to the hut whence they had been liberated. They did not start again for some time, when they took the route for their cot, although, surrounded by mountains, they had not seen the country. Of these two, one did not reach its destination till seven days after; the other failed to appear. Neither (it should be said) had been accustomed to be set at liberty at a great distance from its cot. Another experiment consisted in letting off two pigeons (one of which had not been trained for great distances) about 9:30 A.M., at a point 50 feet under the highest point of the Jungfrau, or 13,750 feet above the sea level. They immediately rose, described several large circles, and took their flight down the valley of Lauterbrunnen, in the direction of Schilthorn and Schwalveren. One of these pigeons reached its cot at Thun at three o'clock next day (eight hours after starting). The other did not turn up. The result of these observations is the more interesting, because in several instances pigeons let off from balloons high up in the air have seemed incapable of sustaining themselves, and have fallen to earth like an inert mass.

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Extinct American Rhinoceroses.

According to an article by Prof. Cope, in the *American Naturalist*, twelve species of mammals which may be called rhinoceroses, have been described from materials obtained from the Tertiary formations of North America, and five other species have been distinguished which may be regarded as more or less allied to that family. This family of mammals still exists in Asia and Africa, but in Europe it disappeared during the glacial epoch. In North America it became extinct at a still earlier period, no remains of rhinoceroses having been found in beds of later age than the Loup Fork, or Upper Miocene period. In both Europe and America the forms included in the family first appear in the Lowest Miocene or Oligocene epochs; that is, in North America, in the White River formation. The family of *Rhinoceridæ* is divided into eight genera, embracing some twenty-eight species, six of which are living, and the remainder fossil species. No extinct species of the true genus of *Rhinocerus* has yet been found in North America or Europe, and no extinct rhinoceros of North America which is known, possessed the median dermal horn that we are familiar with in the living animal. The succession of development in the line of *Rhinoceridæ* is not now difficult to trace; it is probable that the family had its origin from tapiroid animals. The earliest known genus is *Aceratherium*, which is characteristic of the Miocene or Middle Tertiary formations of Europe, and is the primitive form of the true rhinoceroses. The first appearance of dermal horns was apparently in a pair placed transversely on the nasal bones in species of the Eocene tapiroid genus, *Colonoceras*. The same character has been observed in species of the Lower Miocene belonging to the true *Rhinoceridæ*, and which Marsh has called *Diceratherium*. The latter genus appears to have terminated the line exhibiting this structure, and the family in North America remained without a horn. The genus *Aphelops*, consisting of five species, occupies a position intermediate between *Aceratherium* and *Rhinocerus*, and is distinguished from the latter in the number of premolar teeth, and the absence of horns. The largest known species, *A. crassus*, was found by Dr. Hayden on the Niobrara River, Nebraska.

The other species are more restricted geographically. The types possessing the median horn arose in Europe in the genus *Ceratorhinus* of the Middle Eocene, and still survives. This genus occupies a position intermediate between the last named and *Rhinocerus*. It is evident that the descent diverged here at a comparatively late period of geological time into two lines, which are represented at the present day by the African and Indian species respectively. The earliest species of the toothless or African series is the *Atelodus pachygnathus*. The most specialized type of rhinoceros, the genus *Cœlodenta*, of the same line, has become entirely distinct. Its three species yet known were confined to Europe and Northern Asia, and the most formidable of them extended its range with the hairy mammoth within the Arctic Circle. The woolly rhinoceros (*C. antiquitatis*) was evidently the most effectively armed of the family, as it possessed two horns, which, judging of the character of the surface of the skull to which they were attached, must have been of unusual size. Prof. Cope observes that a successive increase of size in the species of this line has taken place in North America with the advance of geologic time. Thus their probable ancestors of the genus *Hyrachyus* were the least of all. The *Aceratheria* of the White River formation were larger—the oldest, *A. mite*, being the smallest. The *Diceratheria* of Oregon were larger still; and the species of the Loup River or Upper Miocene formation were larger, and nearly equal to the large existing species.

The Instincts and Emotions of Fishes.

At the opening meeting of the session of the Linnæan Society of London, held on the 6th of November, Dr. Francis Day read a paper on the "Instincts and Emotions of Fishes." The study of the subject had, he said, received but very little attention in late years, most naturalists apparently accepting Cuvier's view, that the existence of fishes is a silent, monotonous, and joyless one. This is, however, by no means the case, though we cannot, of course, expect to find special expressions so well marked as in higher animals, because fishes have immovable eyelids, have their cheeks covered with scales, and have no external ears, whose motions in some animals are so expressive. The most numerous recorded observations are those which refer to the regard for the young. Some fishes are polygamous, but among the monogamous there is seen a watchfulness over the young, in which the male often plays as important a part as the female. With several species it is the duty of the male to prepare the nest, as well as to take care of the young. In some classes, which are not nest builders, the eggs are carried about in the cheek hollows of the male. In the case of the stickle-back (*Gasterosteus*), the nest, besides being guarded by the male, is gradually opened more and more to the action of the water, and a current is directed over it by a motion of the body. That fishes may be trained to come when called is well known, though as this is generally associated with feeding, it may not be taken to mean much. Cases have been noticed of male fishes remaining at the same spot in a river from which the female has been removed; and, in one case, where a pair were separated for three weeks, they became miserable and seemed near death, while on being reunited they again became happy. In aquaria fishes have been known to attach themselves to particular spots and battles to ensue with intruders. Such combats have been watched, and it has been noticed that while the conquerer assumes more brilliant hues, the conquered sneaks off with his gay colors faded. In their artfulness in obtaining food, fishes show much intelligence, which is more marked with those that eat smaller species, which they entice within their reach. That some classes are capable of an organization for acting together for common good is shown by the way they unite to attack a common enemy. The subject is one that deserves much more attention than it has hitherto received.

Dyes from Mollusks.

In former times some valuable dyes were obtained from shell fish, and of which sepia and the ancient Tyrian purple dye are examples. The abundance of mineral, insect, and vegetable coloring matters which are now available renders these at present quite valueless for industrial purposes, yet some account of them is not without interest. The color known among artists as "sepia" is a liquor contained in the ink bag of *Sepia officinalis*, the cuttle fish. It is of a powerful, dusky-brown color, and works admirably in water, being used in making drawings in the manner of bistre and Indian ink, but is not applicable with oil. Sepia is sold in little bladders, which have to be freed from membranes. This is very easily effected by boiling for a moment in dilute hydrochloric acid, which destroys the envelope, and allows it to be detached by trituration with the hands in water. The bag or pouch being light, floats, and is readily separated on filtration. The black substance which remains is dried, after being washed in hot water. When pulverized finely enough this color is used for water-color drawings; but its hardness renders it necessary to mix it with some foreign color, like sienna, to facilitate the operation of pulverizing. There is great dispute as to the exact source of the once celebrated Tyrian purple, so much used for the garments worn by ancient kings and emperors. Some authorities believe it to have been the product of certain rock lichens, like the "orchella weed" of modern commerce, but the general and most probable opinion is that it was obtained from some species of *Murex* and *Purpura*, the animals of which furnish a rich color. In Britain there are several kinds of mollusks which furnish a dye of this sort; and *Helix janthina*, which is found in the Mediterranean, Atlantic, and South Seas, affords a similar fluid. If the shell of *Purpura lapillus* is broken, there is seen on the back of the animal, under the skin, and near the head, a slender longitudinal whitish vein containing a yellowish liquor. According to E. Schunck, who has investigated this coloring matter (*Chemical News*, No. 39), linen saturated with it and exposed to the sunlight passes from the original yellow through green and blue into purple and scarlet, at the same time exhaling an odor resembling that of assafœtida. This peculiar animal secretion remains undecomposed for years if kept in the dark; but as soon as it is exposed to sunlight, the changes of color make its appearance quite rapidly, without any apparent influence upon it of the presence or absence of oxygen. Chlorine and nitric acid destroy the color, but soap and other acids than nitric are without effect upon it.

By extracting 400 mollusks with alcohol Schunck obtained, in the sunlight, 7 milligrammes of purple. He names this coloring matter *punicin*, and believes it to belong to the indigo group. In ancient times, *Purpuræ* of the best description were chiefly found on the rocks of Tyre, on the coast of Asia. They were also collected at Mininge, on the Grætulan shore in Africa, and on the coast of Laconia in Europe. The colors varied according to the locality in which they were taken; those from Pontus and Galatia, in the north, produced a black dye; in the equinoctial regions a violet hue predominated; while in the south, as at Rhodes, the color was of a richer red. To make various shades of dye several varieties of shell fish were mingled; for instance, 200 *Buccina* were added to 111 *Pelagia* to make the purple color so much eulogized by Pliny, and one of the three shades of purple recorded by the ancients.

Some of the Tyrian garments had a beautiful play of colors, like the shot silks of our own time; and this, it is said, was first suggested by the similar play of colors on the neck of the pigeon. With the destruction of ancient Tyre the beautiful art of dyeing this peculiar color was lost for centuries, until it was again recovered by scientists of the present day, and the discovery would probably have been of much value to commerce had not the use of it been rendered unnecessary by the discovery of the cochineal insect. The latter, again, has been to a great extent replaced by the discoveries of chemistry in the coal-tar colors. In the reign of Augustus one pound of wool dyed with Tyrian purple sold for a sum equivalent to about $180 of our money. We need not wonder at this enormous price when we consider the tedious nature of the process, and the small quantity of dye obtained from each mollusk. For 50 pounds of wool the ancients used no less than 200 pounds of the liquor of the *Murex* and 100 pounds of that of the *Purpura*, being 6 pounds of liquor to 1 of wool; consequently the rich Tyrian purple fabrics vied in value even with gold.

How Nutmegs Grow.

Nutmegs grow on little trees which look like small pear trees, and are generally over 20 feet high. The flowers are very much like the lily of the valley. They are pale and very fragrant. The nutmeg is the seed of the fruit, and mace is the thin covering over this seed. The fruit is about as large as a peach. When ripe it breaks open and shows the little nut inside. The trees grow on the islands of Asia and in tropical America. They bear fruit for seventy or eighty years, having ripe fruit upon them at all seasons. A fine tree in Jamaica has over 4,000 nutmegs on it yearly. The Dutch used to have all this nutmeg trade, as they owned the Banda Islands, and conquered all the other traders and destroyed the trees. To keep the price up they once burned three piles of nutmegs, each of which was as large as a church. Nature did not sympathize with their meanness. The nutmeg pigeon, found in all the Indian islands, did for the world what the Dutch determined should not be done—carried the nuts, which are their food, into all the surrounding countries, and trees grew up again, and the world had the benefit.

The Cause of London Fogs.

Dr. Frankland has lately concluded an investigation into the cause of the persistency and irritating character of the fogs which afflict the large towns of England, a subject which is rather opportune just now. The fogs are not always a sign of dampness, as they occur in comparatively dry air. Dr. Frankland has ascertained that their persistency in a dry medium is due to a coating of coal oil, derived from coal smoke, upon the surfaces of the minute particles of water which compose fog, the oleaginous coating effectually preventing the evaporation of the water. The oleaginous liquids are discharged into the atmosphere in large quantities during the combustion of bituminous coal in fires. Dr. Frankland therefore concludes that by the substitution of smokeless coal, coke, or gas, for bituminous coal, town fogs would cease. This would be a consummation devoutly to be wished; but considering the vested interests which are concerned in the supplying and using of bituminous coals, and the national preference for blazing fires, the reformation is just as likely to come from the adoption of some of the as yet undiscovered means of heating. But much might be done if the gas companies were more enterprising. Apart from the inconvenience, it is waste of money to be using costly illuminating gas for heating when a gas equally effective for that purpose, but far cheaper, could be obtained. Nor would it be requisite to have a double set of mains, as there are several methods by which such gas could be rendered illuminating at a cheap rate.—*The Architect.*

"Ecarlate."

Among the new coloring matters derived from coal there are few which have a better claim to our attention than "ecarlate." This product has already taken the place of cochineal in a considerable number of its uses, and the moment is not far distant when it may be said that cochineal has had its day.

We shall not enlarge here upon the composition of ecarlate, nor upon the manner of its manufacture.

We have to do merely with the manner of using this new product so as to obtain upon wool a beautiful scarlet equaling grain scarlets both in fastness and brightness. For 100 lb. of wool add to the necessary quantity of water 2½ lb. of sulphuric.

Dissolve in boiling water 1½ lb. of the coloring matter.

Heat the water to about 86° Fah., enter the wool, and work it constantly while the water is raised slowly to a boil.

The dyeing is completed when the beck is exhausted, that is, when it holds no more coloring matter in solution, which is generally effected in about 25 to 30 minutes.—*Moniteur des Produits Chimiques.*

To Dye Straw.

Magenta Red.—The first operation for dyeing this or any other color on straw is to steep the latter in a bath acidulated with sulphuric acid for 12 hours. For magenta, take an acid bath of 4° to 5° Bé. The straw after washing is immersed for 12 hours in a bath kept at 30° to 40° C., containing the necessary amount of dye. Now wash well and dry. Other aniline colors do not dye straw with the same facility.

Maroon, with Logwood.—Clean the straw by boiling with a solution of carbonate of soda, then steep in a bath of logwood for two hours. To give a bluish tint, add some blue stone to the bath; if too much of the latter is used the straw will have a greenish hue. This is a loose color, only employed on account of its cheapness.

Coffee and Chocolate Stains.—If the coffee or chocolate contains milk the stains produced are more pronounced than if prepared with water only, but they are also more easily removed. To remove them, the stains are washed with a mixture of yolk of egg in tepid water. If with this treatment they still remain, add a little spirit to the mixture, and rub with a hard brush.

Blue Linings for Hats.—In producing these the cloth is not dyed, but the thickened color is applied to it in the following manner: Prepare the color with 22 gallons of water, 30 lb. starch, 2 lb. tallow, 44 lb. ultramarine blue; mix, boil, pass through sieve; print on the roller first on one side, then on the other, and dry on the cylinder.

Preparing Steel.

A novel mode of preparing steel has been suggested by Signor Guido, an Italian engineer. It consists in electrolyzing water by means of a dynamo-machine, and smelting the carboniferous ore by reducing it with the oxygen and hydrogen gas obtained, and thus producing either steel or pure malleable iron at will. To turn out two tons daily would, however, require the constant use of a 120 horse power engine.

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Softening Processes for Hard Water.

So much of the best water obtained in large districts of England is rendered hard by the presence of an excess of bicarbonate of lime, that an account of the processes by which this hardness can be reduced, and the chalk or limestone waters rendered more available for washing and for some purposes of cooking, will not, says the *Journal of Gas Lighting*, be out of place at the present time. Dr Clark, of Aberdeen, long ago suggested that the addition of a certain quantity of quicklime, which should combine with the carbonic acid holding the lime in solution in the water, and cause the precipitation of an insoluble powder of carbonate of lime, including much of that which had been held in the water, could be carried on economically, and would be valuable in some cases. He considered that the fine powder would be available for certain purposes in the arts, at least to some extent, and that in this way the cost would be diminished. Dr. Clark pointed out that every pound weight (16 ounces) of chalk consists of 8·64 ounces of lime and 7·36 ounces of carbonic acid, and that the 8 64 ounces of lime (which could be separated by burning the chalk in a kiln) would be soluble in 40 gallons of water. This pound weight of chalk, however, would require 5,000 gallons of water for its solution. He explained also that by combining a pound of chalk (which, as we have seen, already contains 7 ounces of carbonic acid) with another 7 ounces of carbonic acid, the resulting substance (which is now a bicarbonate of lime) would be soluble in 400 gallons of pure water, the result being a water of the same average hardness as ordinary well water obtained from the chalk strata. If, then, 40 gallons of clear saturated lime water containing 9 ounces of lime is mixed with 400 gallons of clear chalk spring water also containing 9 ounces of lime, the ingredients combine, forming 2 pounds of chalk in a light impalpable mud, and leaving clear water above, containing about 1½ grains of carbonate of lime per gallon.

An improvement on this process, which has been adopted on a moderate scale in various places in the manner above described, was some years ago suggested by Mr. Porter, and his modification, called "The Porter-Clark process," was adopted at the new Middlesex County Asylum on Banstead Downs. There, in the early part of 1878, about 6,000 gallons of water per hour were purified, throwing down and separating the impalpable powder as mud with increased rapidity and efficacy, by forcing the water to pass through disks of cloth after being treated with the lime. The operation was, however, both slow and costly.

Dr Clark's process has been adopted at Caterham, Canterbury, Tring, Aylesbury, Redhill, Colne Valley, Swindon, and by the Kent Water Company. In some cases it has been retained, but we do not hear of many recent applications. The rapid accumulation of the precipitate, and the difficulty of so far drying this mud as to render it easy of transport, may be judged of when we remember that for every million gallons per day of chalk water softened, a mass of wet mud, weighing more than two tons when dry, would have to be handled. Thus, to apply the method to the quantity of water now used in the metropolis, assuming it to be all lifted from chalk wells, we should have to reduce to dryness, and afterward deal with nearly 90,000 tons of impalpable powder of chalk per annum. This, however, is not the sole, nor perhaps the most serious objection to the process. The water thus softened has been found to deposit rapidly, in the pipes that convey it to its destination, a mass of minute crystals of carbonate of lime, choking them up, and being very troublesome to remove.

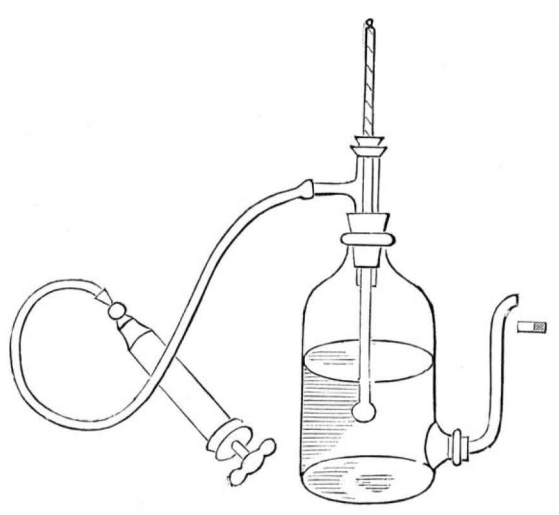
Wherever limestone water prevails, the same objection as to hardness is found to apply to the water that has long remained in contact with the rock. No doubt hardness is uneconomical with regard to the use of soap, but it is more than doubtful whether for drinking purposes it is in any way objectionable. It certainly makes better beer and other fermented liquors than soft water, it is far more pleasant for drinking, and probably more wholesome. Even for infusions such as tea it is hardly inferior, as, while boiling hard water extracts the aroma and the better flavor, it leaves behind the tannin and the coloring matter, which are not desirable or pleasant, and which give the deeper color to tea made of soft water.

The process of softening does not in any way assist in the filtration of water, nor does it remove the earthy yellow tinge of flood waters, or the disagreeable taste of vegetation sometimes observed. In none of these respects does it improve its quality. On the other hand, ordinary filtration through sand, when carefully conducted, does unmistakably improve the quality, and even diminish the hardness of hard water. For practical purposes it may be accepted that on a large scale no better filter material has been discovered than fine, clean, sharp sand. It must, however, be kept clean by frequent scraping and washing, and the washing must be thorough. Filtering sand soon becomes choked in the lower part of the bed when neglected, and the quality of the water passed through soon begins to deteriorate if great care is not adopted, and some expense incurred in reference to clearing the filter beds.

It may be well to allude very briefly to the nature of Dr. Clark's test of hardness, and the meaning of the degrees generally adopted. The test consists in ascertaining the quantity of a standard solution of soap in alcohol that is required to produce a permanent lather when mixed with a given quantity of the water under examination. The solution requires to be made with care and measurement, and the whole value depends on the uniformity of strength of the solution. Each degree of hardness in water is understood to mean a grain of chalk, or its equivalent, dissolved in the water. Thus, a water of 16° of hardness contains 16 grains of chalk per gallon, and 100 gallons of such water would require 32 ounces, or 2 pounds of soap to reduce it to the condition of distilled water. The hardness of water is inferred from the number of measures of soap solution employed, a table being used for reference.

Clarification of Gelatinous Solutions.

A bottle having two necks—one at the top and the other about an inch from the bottom—is procured, and to the lower neck there is fitted, by means of an India-rubber cork, a glass tube bent something like the neck of a coffee pot. If a gelatinous solution (not quite free from intermingled air-bells) be now put into the bottle, the necessary temperature being maintained by means of a warm water bath, the air-bells will gradually rise to the surface, after which the clear liquid may be decanted through the spout-like tube. In order to expedite the rising of the air-bubbles to the surface, the upper neck can be connected with an air pump, so that the space over the gelatinous solution may be rendered



vacuous; but in this case it is of course necessary to close the end of the spout by means of a cap or plug of caoutchouc, and it is convenient to adapt a thermometer into the neck in such a manner that the bulb of this instrument shall be immersed in the gelatinous liquid. Both these latter ends may be attained by fitting into the upper neck a glass tube a couple of inches long by half an inch in diameter, and provided with a side branch for connection with the air-pump while the thermometer passes through the upright tube, where it is fixed by an India-rubber cork. A caoutchouc tube with coiled wire inside is convenient for connecting the apparatus with the air pump, as such a tube does not collapse, in consequence of the pressure of the external air.

Here, then, is the complete apparatus ready for use, and I feel sure that any one frequently using or experimenting with gelatinous solutions will find it exceedingly convenient in actual practice. T. BOLAS, F.C.S.

Moulding Mixture for Gelatine Photo Plates.

For moulding the gelatine relief Leipold's mixture may be employed, and by the exercise of care very perfect results may be obtained. The following receipt for Leipold's mixture is taken from Husnik's *Heliographie:* Seventy parts of bitumen are melted at a moderate heat, and to the melted bitumen there are added the following, each being melted previously: 425 of spermaceti, 200 of stearine, and 170 of white wax. All these being well incorporated, 70 parts of finely ground blacklead are stirred in. The plate to be moulded being thoroughly swelled, is removed from the water, dried with a cloth, and gradually raised to as high a temperature as it will bear without injury to any details of the device, this being generally about 35° C. A metal border being now fixed round the edges, the above composition, which ought not to be at a higher temperature than 40° C., is poured on, the composition being allowed to flow over the plate in one continuous wave. The thickness of the layer of composition may vary from half an inch to one inch in thickness, according to the size of the plate, and no attempt should be made to remove the cast until the next day, when it will generally separate with great ease. The mould is next made conducting with bronze powder, and electrotyped. The first electrotype cast obtained should be very slightly oiled, and a second cast made in it will be the required printing plate.

Euphorbium Varnish.

There seems a fair amount of promise in the experiments made with euphorbium varnish as a protective coating for iron. Some years ago the workmen at Natal found that when they cut certain plants of the family Euphorbiaceæ with an iron or steel instrument, a layer of very adherent gum was left upon the blade. The metal so coated appeared entirely protected from rust. Consequently further attempts were made to see if gum euphorbium could not be practically utilized for the preservation of metals. Sheets of iron coated with the gum were plunged into sea water at South Africa, where the well known rapidity of the growth of vegetation exercises a most deleterious action upon iron-coated vessels. As euphorbium can be obtained at Natal close along the sea coast, great facility was offered for putting its anti-corrosive capabilities to the test. The experiments are said to have been completely successful; and with a view of confirming these results, a tincture was made of gum euphorbium dissolved in spirit. This solution was readily applied to the bottom of ships' keels, and to other metallic surfaces. On evaporation of the spirit, the gum was left permanently adherent. Trials of this same preparation made during the past two years at Chatham have shown that iron so varnished remained uninjured after considerable exposure to the corrosive action of the water of the docks. In Africa the gum varnish has proved successful against the ravages of white ants, probably owing to its extreme bitterness.

The New German "Cure" for Phthisis.

For some few weeks past the German medical press has been discussing a new "cure" for phthisis, and accounts, more or less accurate, of the method and its benefits have found their way into the daily and weekly papers, both on the Continent and in this country, and have excited a considerable amount of attention. It is thus described in a letter from Dr. Kroczak, the assistant to Professor Rokitansky, of Innsbrück, who has been treating the consumptive patients in his wards by the new method, and, it is said, with results that have far surpassed his expectations; but as yet no definite statistics of the cases and their course have been published:

"Natrium benzoicum—one pro mille of the bodily weight, diluted to a solution of 5 per cent—is inhaled twice a day, in the morning and evening, by means of a well-acting 'Siegle's pulverizator,' without interruption during seven weeks. Besides, the appetite, which will show itself soon, is to be fully satisfied by a meat diet, and fresh air and prevention of all enervating influences are to be insured."

The remedy, therefore, is simple enough. A 5 per cent solution of benzoate of soda is to be inhaled twice daily for seven weeks by means of a Siegle's atomizing inhaler, in the proportion of 1 part of the salt to a 1,000th of the body weight. The quantity necessary for a patient 140 pounds in weight would, therefore, be about 2¼ ounces at each inhalation; and the inhaler must be carefully adjusted for such a large amount to be taken into the air passages. A certain proportion will always escape into and permeate the air of the room, and the patient should remain therein for an hour after each inhalation.

We can easily understand that inhalations of benzoate of soda may be of some benefit in checking the formation of mucus or pus in bronchiectatic and even in phthisical cavities; in fact, the old Friar's balsam has long been, and is still, frequently employed with advantage for this purpose. This, however, is not the result that is to be secured by the new "cure." The benzoate of soda is supposed to destroy the specific bacteria to which the tuberculizing process is due, and then the common inflammatory changes lose their destructive characters and slowly heal. The facts on which such a theory can be based are almost entirely wanting, and few pathologists, in this country at all events, will be found to give in their adhesion thereto, whatever may be the results of the treatment. We should, however, say that the theory has the support of so distinguished a scientist as Professor Klebs, of Prague, and that Dr. Max Schneller, a "privat-docent" in the University of Greifswald, is stated to have failed in inducing tuberculosis in rabbits that were kept for several hours daily in a box which had been filled with these benzoic vapors, although these animals are, as is well known, very readily infected with this disease.

We hope that this treatment may be employed in some selected cases of phthisis, in different stages, so that we may have some trustworthy data on which to found definite conclusions as to its real value. Meanwhile we can only say that *a priori* it seems to us more likely to benefit chronic cases of phthisis with profuse expectoration than those in which true tuberculosis is taking place. It is necessary to add that benzoic fumes are extremely irritating, so that they would be contra-indicated in all cases where there were any signs of irritation in the throat, larynx, and larger bronchi, and that when the vapors are being inhaled, even in the most chronic cases, or in healthy subjects, very distressing cough is likely to come on; and we doubt if many patients will be able to breathe such a large quantity as we have mentioned. Moreover, at present, sodium benzoate is very expensive.—*London Lancet.*

Surgery by the Electric Light.

The London *Lancet* states that Dr. Berkeley Hill recently operated for vesico-vaginal fistula in University College Hospital, while the vagina was lighted up by Mr. Coxeter's application of the glowing platinum wire. The apparatus consisted of a fine wire twisted into a small knot. Through this knot was sent a continuous galvanic current, strong enough to maintain the wire at a white heat. The wire was inclosed in a glass chamber, which was itself also inclosed in another glass cover. Through the space between the glasses, a current of water was allowed to flow in order to preserve a low temperature round the light. The afternoon, which was dark and foggy, afforded a good opportunity of testing this plan of lighting up deep interiors, and the illumination was completely successful. A strong light was maintained for more than an hour, close to the margins of the fissure, without impeding the manipulations of the operator.

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The Therapeutical Action of Cold.

BY W. H. THOMSON, M.D., PROFESSOR OF THERAPEUTICS AND MATERIA MEDICA IN THE MEDICAL DEPARTMENT OF THE UNIVERSITY OF THE CITY OF NEW YORK.

Remedial agents are of two kinds: First, drugs; and second, other therapeutic measures, such as temperature, electricity, etc. For the sake of convenience, we will here consider those remedial agents which are not drugs, and first, among them, we will study one of the physical forces or imponderables—cold.

Physically, cold is the absence of heat. Therapeutically, it is a positive agent, and has five actions:

1. Tonic.
2. Styptic.
3. Antiphlogistic.
4. Anæsthetic.
5. Antipyretic.

In the first three cold acts only upon the vaso-motor system as a pure irritant neurotic. In the last two it acts simply on physical principles.

COLD AS A TONIC.

We have said that cold, when it acts as a tonic, is an irritant. Every irritant produces a shock and causes an expenditure of the energy of the part irritated. The energy of the part irritated, therefore, becomes depressed; but this depression differs from that produced by a simple sedative, in that it is followed—provided the shock is not so great as to cause exhaustion—by a *reaction* to or beyond the condition in which the part was prior to the irritation. Thus, cold, as an irritant, affects the vaso-motor system and produces a shock which is followed by a reaction. In other words, this system is exercised, and all moderate exercise tends to strengthen the organ called into action, and permanently to improve its nutrition. Cold, then, is a vascular tonic, and may be used generally or locally. When the circulation is feeble and there is loss of muscular power, the general use of cold will arouse the heart, restore arterial tone, and thereby improve the nutrition of the whole body. For this purpose either the dip, shower, or sponge bath may be used, according to the strength of the patient, taking care never to cause exhaustion by its too frequent or too protracted use. A thorough reaction, as indicated by a glow of the skin, should always follow the bath, and never a sensation of lassitude or fatigue. When the irritant effect produced by the cold water alone is not sufficient, salt or some mild rubefacient may be added. If the patient is too feeble to bear even the sponge bath, simple exposure of the surface of the body to cold air will often prove beneficial. In all cases reaction may be assisted by friction with a rough towel.

A cold douche to the nape of the neck is indicated in the following conditions:

1. When, after sunstroke, the arteries of the head remain dilated, and there is headache and dizziness on exertion or exposure to the sun
2. In all cases in which headache is confined to one side, and is attended by dilatation of one temporal artery and suffusion of one eye.
3. In false croup, or the crowing respiration of children.
4. In tinnitus aurium, when the throbbing is synchronous with the beating of the heart, and the tympanic arteries are distended, the cold douche to the nape of the neck, aided by the internal use of hydrobromic acid, may afford relief.

Sponging the chest of a phthisical patient with cold water lessens the susceptibility to cold.

Local applications of cold water are useful in promoting absorption of inflammatory effusions and exudations in the subacute and chronic stages; also in restoring the balance of the circulation in the liver and spleen when enlarged in malarial poisoning.

The hip or sitz bath is useful in hemorrhoids, prolapse of the rectum, and congestion of the pelvic viscera.

COLD AS A STYPTIC.

As a styptic cold acts by constringing the arteries through its influence on the vaso-motor nerves. It is preferable to astringent drugs or other hæmostatics, because it obviates the necessity of applying irritant substances to the bleeding part. Nor need the cold always be applied directly to the seat of the hemorrhage; for it will also affect distant parts in accordance with the laws of the vaso-motor system, the most important of which are the following:

First.—An impression on the afferent nerves of a given part will cause a variation in the caliber of the arteries of that part.

Second.—An impression on the afferent nerves of a given part will cause a variation in the arteries of all organs situated directly beneath that part.

Third.—In the case of organs which are in pairs and perfectly symmetrical, as the eyes, ears, hands, and feet (the lungs, kidneys, and testicles are not), variations in the caliber of the arteries of one will cause a similar variation in the other.

Fourth.—Variations in the caliber of the arteries of certain parts are accompanied by corresponding changes in the arteries of certain other parts, and these particular associations are to be determined by experiment; for example, the relation between the circulation of the feet and that of the pelvic viscera and the pharynx, and the relation of the circulation at the nape of the neck to that of the head and face.

The following instances will suffice to illustrate the application of these laws in the use of cold:

1. Cold water applied directly to a bleeding surface.
2. Ice-bags to the epigastrium to check hæmatemesis.
3. Holding any cold body in one hand to arrest hemorrhage in the other.
4. Cold foot baths to arrest metrorrhagia.

In post-partum hemorrhage the best means of applying cold is by ether spray, for the sudden and intense impression produced causes effectual contraction of the uterus without chilling the patient. If ether spray is not available, cold water should be poured upon the abdomen from a height of two or three feet, the shock of the falling water materially assisting the action of the cold. Either of the above measures may be used for hæmoptysis.

COLD AS AN ANTIPHLOGISTIC.

As an antiphlogistic, cold may be used to arrest an acute inflammation, unless suppuration has occurred, or to prevent inflammation when threatened. This it does by causing a protracted constriction of the arteries, thereby preventing the active congestion essential to all acute inflammation. It should be invariably applied as dry cold, directly to the part affected, in sufficient intensity to relieve pain, and continued so long as the exciting cause exists. If, before the tendency to inflammation has entirely disappeared, a neuralgic pain occurs, it is a sign that the vaso-motor nerves have become exhausted, and the use of cold must at once be discontinued, or gangrene will result; moreover, the patient will feel more comfortable without than with the cold applications. This neuralgic pain is continuous, and, if the injured part be one of the extremities, it extends from the part injured toward the trunk. Inflammatory pain, on the other hand, is local throbbing, accompanied by local heat, and is relieved by more thorough application of cold.

In fractures, or other severe injuries near joints, the injured parts should be surrounded with pounded ice placed in pigs' bladders or rubber bags, two or three layers of perfectly dry muslin being placed between the skin and bags, lest the parts should be chilled too suddenly. A bottle filled with ice water makes a good antiphlogistic splint for injuries of the hand. Inflammation of the eyes may be controlled, and its spread from one eye to the other prevented, by means of cold applications. Ice bags should be applied to the head and spine in epidemic cerebro-spinal meningitis. Cold applications will control the spread of erysipelas, and are the best means for relieving febrile headache. Headache from uterine trouble is best relieved by moist warmth. Cold should not be used antiphlogistically in any acute inflammation of internal organs, except peritonitis with vomiting, and meningitis.

COLD AS AN ANÆSTHETIC.

The use of cold as an anæsthetic depends upon its physical property of freezing tissue and deadening sensation without injuring vitality It is most useful in operation where no great thickness of tissue is involved, as in opening abscesses, amputation of fingers, Cæsarean section, and ovariotomy. In all cases the action of the cold should be secured as rapidly as possible. Apply ether spray to the part alone which is to be operated upon. Anæsthesia is complete as soon as the skin becomes white and glistening.

COLD AS AN ANTIPYRETIC.

When the abnormal elevation of the bodily temperature is due to insufficient radiation of heat, as in some nervous disorders, it is not generally in itself dangerous; for it has been known to reach 123° Fah., and remain there for several weeks. But if, as in fevers, the rise of temperature depends upon excessive chemical changes, then the heat itself is injurious, causing arrest of gland secretion, as well as extensive destruction of tissue In every fever there is a certain point beyond which, if the temperature rises, certain structural changes will take place. The glands become affected with cloudy swelling, and fatty degeneration ensues, and the muscles affected in the same manner become remarkably brittle.

The point at which these changes occur differs in each fever. In scarlet fever it is 105° Fah ; in typhoid fever, 106° Fah.; in relapsing fever, from 107° to 108° Fah.; and in erysipelas still higher. Beyond this dangerous point in each fever the temperature should not be allowed to rise, but must be lowered by the use of cold, the result of which is simply the abstraction of heat. This may be effected by immersion in a cold bath or by the cold pack. Place the patient in a bath of 75° Fah., and gradually cool the water down to 65° or 60° Fah —never lower, and at the same time use cold affusions to the head continuously. At first the temperature will rise slightly, owing to the blood being driven from the surface of the body into the viscera, which are always a little warmer than the skin; but the bath should be continued until the temperature is reduced to 100° Fah., provided the fall is gradual—that is, one degree in six, five, four, or three minutes If it falls one degree in two and a half minutes stop the bath when the temperature has reached 101° Fah.; for in most cases a further reduction of one degree will occur after the bath is discontinued. If the fall in temperature during the bath be one degree in *two* minutes, the patient should be taken out at once, whatever the actual temperature may be, for in such cases there is danger of the subsequent fall becoming uncontrollable, reaching perhaps 97° Fah., and the patient passing into collapse. Should this at any time occur, wrap the patient in hot blankets, apply hot saucers to the epigastrium, and give brandy or other stimulants.

When, for any reason, the bath is impracticable, the cold pack may be used, always, however, with the same precautions as in the use of the cold bath. First wrap the patient in a sheet wrung out of water at an ordinary temperature, say 70° Fah., and then lay on other sheets wrung out of ice water. The cold bath or pack should be repeated often enough to keep the temperature below the point of danger for that particular disease. If necessary, use one every hour. If, however, two or three a day are sufficient, one should be so timed as to be given just before the highest rise of the fever heat—that is, usually between two and three o'clock in the afternoon.

The contra-indications to the antipyretic use of cold are hemorrhage from the bowels and notable variations of temperature from the regular course. Bronchitis and pneumonia are not necessarily contra-indications.

The Physical Cause of Intermittent Fever.

The July number of the *Zeitschrift*, edited by Professor Klebs, contains some particulars of an investigation into the physical cause or poison to which marsh or intermittent fever is due. The inquiry was conducted by Professor Klebs, of Prague, in conjunction with Signor Tommasi, Professor of Pathological Anatomy at Rome. The two investigators spent several weeks during the spring season in Agro Romano, which is notorious for the prevalence of this particular kind of fever. They examined minutely the lower strata of the atmosphere of the district in question, as well as its soil and stagnant waters, and in the two former they discovered a microscopic fungus, consisting of numerous movable shining spores of a longish oval shape. This fungus was found to be artificially generated in various kinds of soil. The fluid matter obtained was filtrated and repeatedly washed, and the residuum left after filtration was introduced under the skin of healthy dogs. The animals experimented on all had the fever with the regular typical course. After explaining minutely the results of their various investigations and experiments, these gentlemen are of opinion that they have discovered the real cause of the disease in question. As the fungus grows into the shape of small rods, Tommasi and Klebs have given it the name of *Bacillus malariæ*.—*Medical Times and Gazette.*

Reappearance of Small-pox in the United States.

The attention of health officers and sanitarians is called to the appearance in the United States of small-pox, and an evident tendency toward its out-cropping in other cities than those in which it has already been noted.

Since the 15th of November deaths from this disease have been reported in the cities of New York, Philadelphia, Washington, and San Antonio. In Philadelphia, with its long immunity from this affection, extending over several years, and in the District of Columbia, there is enough of evidence to show the tendency to spread, previously mentioned, from centers so far removed from each other as to preclude the idea of transmission by actual contact, as a search into the definite origin of the earliest reported cases has as yet failed to reveal any facts concerning either the mode of origin or transmission. The history of the earliest cases thus far reported in Washington are detailed in this number of the *Bulletin*. It is worthy of note here that this disease has existed along our borders for some time—for example, at Montreal, St. Johns, N. B., Havana, and Matamoros—and also that all of the principal cities of Europe have furnished cases—more especially Paris, which has reported 214 deaths since August 21.

A communication from Dr T. C. Minor, health officer of Cincinnati, Ohio, to the National Board of Health, invites the attention of those interested in the prevention of the spread of small-pox and other diseases to the importation as well as the inter-state shipment of rags as a carrier of this and other diseases. Dr. Minor states that rags gathered during the summer from yellow fever infected localities and from infected persons are being forwarded to Eastern points, and also that rags, bedding, and second-hand clothing from cities and persons affected with smallpox may become the carriers of variola from foreign as well as domestic ports to the United States. It it well known that in 1873, in Massachusetts, the origin of small-pox in eleven cities in that State was traceable directly to the importation of rags from foreign or domestic places. No further warning is deemed necessary to be given at present concerning the appearance of this eminently preventable disease.

The sanitary management of the sick with this affection is too well known to every physician to be reproduced here. In view, however, of the probable appearance of this disease in other localities, it is proper to remind every one interested in its prevention and spread that the only absolute preventive measure necessary is *compulsory and thorough vaccination and re-vaccination.*—*Health Bulletin.*

The Healthiest City in the United States.

In the annual tables of vital statistics, lately published by the Health Department of New York city, among the exhibits is the comparative death rate of various cities, American and foreign. The exhibit gives the population and death rate of over three hundred and fifty cities in different parts of the world, of which sixty are American and the remainder foreign.

It appears from these tables that the city of Burlington, Iowa, with a population in 1875 of about 20,000, enjoys the pre-eminence for health, its annual death rate being only 4·84 deaths per 1,000 souls. Stockton, Cal., stands next, 7·47; but this is 62 per cent more unhealthy than Burlington. There are probably a few, but only a few, more favored places than the latter in all the world. The death rate for New York city is 23·93 per 1,000; New Orleans, 50·71; London, 23·40; Paris, 24·71.

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NASAL AND BRONCHIAL CATARRH.—A STRONG RECORD.

Rev. T. P. Childs, of Troy, Ohio, whose advertisement of his Catarrh Treatment appears in this issue of the SCIENTIFIC AMERICAN, has addressed our subscribers and readers before. It is not surprising when we consider the facts, that Mr. Childs should be constrained to urge the attention of people to this matter, and mention his ability to treat successfully this scourge of the human race. Leading men of every denomination publicly state that Childs' treatment has cured them or their families of Catarrh or Throat difficulties, not obscure, unknown men, but men whose reputation is national, men widely known for their services in the pulpit or the missionary field. Editors and publishers of our leading periodicals, among them the *Congregationalist* and *Watchman*, of Boston, the *Illustrated Christian Weekly* and the *Examiner and Chronicle*, of New York, the *Journal and Messenger* and *Daily Gazette*, of Cincinnati, and many others, have personally investigated the facts, and they are satisfied that, while Mr. Childs is not —as he does not claim to be—a regularly educated physician, but, on the other hand, a highly esteemed minister of the gospel, who has spent thirty years as a pastor in the State of Ohio, yet he has made such a study of the disease known as Catarrh, as to have enabled him to treat it with most extraordinary success.—*Adv.*

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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Launches and Engines. S. E. Harthan, Worcester, Mass.

Inventors' Institute, Cooper Union. A permanent exhibition of inventions. Prospectus on application. 733 Broadway, N. Y.

Brick Presses for Fire and Red Brick. 309 S. Fifth St., Phila., Pa. S. P. Miller & Son.

The Baker Blower ventilates silver mines 2,000 feet deep. Wilbraham Bros., 2318 Frankford Ave., Phila., Pa.

To stop leaks in boiler tubes, use Quinn's Patent Ferrules. Address S. M. Co., So. Newmarket, N. H.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Bradley's cushioned helve hammers. See illus. ad. p. 45.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Noise-Quieting Nozzles for Locomotives and Steamboats. 50 different varieties, adapted to every class of engine. T. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Sheet Metal Presses. Ferracute Co., Bridgeton, N. J.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Forges, for Hand or Power, for all kinds of work. Address Keystone Portable Forge Co., Phila., Pa.

Eclipse Portable Engine. See illustrated adv., p. 30.

Portable Railroad Sugar Mills, Engines and Boilers, Atlantic Steam Engine Works, Brooklyn, N. Y.

Silent Injector, Blower, and Exhauster. See adv. p. 46.

The Paragon School Desk and Garretson's Extension Table Slide manufactured by Buffalo Hardware Co.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien M'f'rs, 23d St., above Race, Phila., Pa.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For Superior Steam Heat. Appar., see adv., page 46.

For Pat. Quadruple Screw Power Press, see adv., p. 45.

Valve Refitting Machine. See adv., page 46.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of last week.

The E. Horton & Son Co., Windsor Locks, Conn., manufacture the Sweetland Improved Horton Chuck.

Engines repaired without loss of time. L. B. Flanders Machine Works, Philadelphia, Pa.

Special Wood-Working Machinery of every variety Levi Houston, Montgomery, Pa. See ad. page 405.

Power Hammers. P. S. Justice, Philadelphia, Pa.

For Reliable Emery Wheels and Machines, address The Lehigh Valley Emery Wheel Co., Weissport, Pa.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad p. 406.

Combined Step Ladder, Ironing Table, Clothes Frame. Good thing sure. See adv. at bottom of page 29.

Deoxidized Bronze. Patent for machine and engine journals. Philadelphia Smelting Co., Phila., Pa.

Hand Fire Engines, Lift and Force Pumps, for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N. Y., and 93 Liberty St., N. Y. city, U. S. A.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Planing and Matching Machines, Band and Scroll Saws, Universal Wood-workers, Universal Hand Jointers, Shaping, Sand-papering Machines, etc., manuf'd by Bentel, Margedant & Co., Hamilton, Ohio. "Illustrated History of Progress made in Wood-working Machinery," sent free.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

NEW BOOKS AND PUBLICATIONS.

THEORIE DES FACHWERKS VON A. FOEPPL. Leipzig: Arthur Felix. 1880. 8vo, pp. 135.

This work treats of the theory of the formation of trusses, and is divided into the following two chapters: 1. The general theory of the formation of trusses; and 2. The special theory of certain defined trusses. In the first chapter the author has very elaborately described the geometrical theoretical formation of trusses and the forces acting upon the same, and shows that the main object of the theoretical calculations is to obtain the values of the pressures and strains in the several joints of a truss. The first chapter closes with a carefully prepared classification of the several types of trusses. The second chapter begins with instructions in regard to the most reliable and most simple methods of calculating the strains in the trusses, the position of the separate loads, and the most unfavorable position of the entire load. Great care has been given to the calculation of the strains in horizontal and arched trusses of well known construction, and of new combinations of the elements, which, although they have not been practically carried out, theoretically surpass all others. The work is carefully illustrated with numerous wood cuts and engravings.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) W. B. P. asks how to make a "planchette" board. A. A planchette board is simply a small thin board of any desired shape, supported upon three small easily moving casters, and carrying a pencil capable of marking on the surface upon which the casters rest.

(2) G. R. B. asks what is gasoline. It is burned in lamps like gas. I claim it is a dangerous article to use. My neighbor says not; he has a barrel in his cellar. A. Gasoline is one of the lighter distillates from petroleum. It is a very dangerous article to have about the house, as it forms vapor at ordinary temperature, which, when mixed with air, is likely to explode when near a fire.

(3) E. S. asks: What is the best temper for coal picks and drills? A. Heat them to a cherry red, and draw them down to a purple.

(4) J. W. B. asks (1) how to make a whitening solution for silver plating. A. Dissolve 2½ troy pounds cyanide of potassium, 8 ounces carbonate of soda, and 5 ounces cyanide of silver in 1 gallon rain or distilled water. This solution should be used with a compound battery of 3 to 10 pairs according to the size of the work to be plated. The use of this solution will insure the adhesion of silver to all kinds of brass, bronze, type metal, etc., without employing mercury, the frequent use of which is injurious to the operator. 2. How can I make a finishing solution? A. Dissolve 4½ troy ounces cyanide of potassium and 1½ ounces cyanide of silver in 1 gallon rain or distilled water. This solution should be used with one large cell of Smee's battery, observing that the silver plate is placed as near the surface of the articles to be plated as possible.

(5) O. R.—Oil stone powder is preferred to pumice stone powder for polishing fine brass work.

(6) N. A. asks: How can I case-harden small articles of iron? A. Case-hardening, to be quickly performed, is done by the use of prussiate of potash. This is powdered and spread upon the surface of the iron to be hardened. After the iron is heated to a bright red, it almost instantly fluxes and flows over the surface; and when the iron is cooled to a dull red, it is plunged in cold water. Some prefer a mixture of prussiate of potash, 3 parts, sal ammoniac, 1 part; or prussiate, 1 part, sal ammoniac, 2 parts, and finely powdered bone dust (unburned), 2 parts. The application is the same in each case. Proper case-hardening, when a deep coating of steel is desired, is done by packing the article in an iron box with horn, hoof, bone dust, shreds of leather or raw hide, or either of these, and heating to a red heat for from one to three hours, then plunging the box into water.

(7) P. T. asks how to bronze small articles of hardware. A. Brown bronze dip, for coating hat hooks and similar small hardware articles, is made of iron scales 1 lb., arsenic 1 oz., muriatic acid 1 lb., zinc solid 10 oz. The zinc should be kept in only when the bath is used. The castings must be perfectly free from sand and grease.

(8) C. P. W. asks how to polish and restore the luster to tortoise shell that has lost its brightness through use. A. First apply rotten stone and oil with a felt wheel or rubber. Finish with the hand.

(9) C. E. B. writes: 1. Suppose a gun is placed in a vertical position so that when it is fired the ball, after having spent its force, will return to the muzzle of the gun on its downward course, will its velocity be the same when it reaches the muzzle as when it left it? A. Nearly so; it will be less by the amount of retardation due to the friction of the atmosphere. 2. Suppose we have two reservoirs, one of which is 1,000 feet in diameter and the other 100 feet in diameter, each round and three feet high and full of water (still water), which will require the strongest walls to hold or which has the greatest pressure on its walls? A. The larger; the pressure on the walls for unit of surface is the same in both, but the larger has ten times the surface. 3. My friend asserts that base ball players can pitch or throw a perfectly round ball in such a manner as to cause it to curve to the right or left as they please; the same with billiards. I say no. I assert that a perfectly round ball cannot be made to curve in that manner in still air. Who is right? A. Your friend. See page 312, Vol. 37, SCIENTIFIC AMERICAN.

(10) W. C. asks: Will any substance that will sink in water sink to the bottom regardless of depth? A. Yes; on account of the slight compressibility of water, the variation of density with the depth is scarcely sensible.

(11) J. W. L. asks if there is any device by which the speed of a pulley can be increased or decreased without changing the speed of the drive wheel, or using the cone shaped pulleys. A. You may use plain cones arranged in a manner similar to cone pulleys. There is a kind of friction gearing sometimes used for the purpose.

(12) D. B. asks: 1. Does speed increase in the same ratio with power? Suppose the power necessary to propel a steamer fifteen miles per hour is represented by 34,540, what would be the speed attained by 1,476,632? A. The power increases approximately as the cube of the speed, hence the speed will be as the cube root of the power. Your speed will be as the cube root of the numbers given representing the power. 2. Is a pressure of 350 lb. per inch practicable? A. Yes.

(13) C. G. D. asks: From which of two engine cylinders can the most power be obtained, one measuring 14 inches by 22 inches, the other 22 inches by 14 inches? A. 22 inches diameter of cylinder by 14 inches stroke, if the figures given are intended for diameter and stroke.

(14) D. G. B. asks: Can you give me a minute description of the construction of the receiving telephone seen in the bottom central figure on page 15 of current volume of the SCIENTIFIC AMERICAN? A. The telephone is the same in principle as Bell's, which has been frequently described in these columns. (See SUPPLEMENT 162.) The only difference is that the magnet in the telephone referred to is curved, and the soft iron core of the helix is screwed into the side of the magnet; and the end which faces the magnet is concaved or made in a cup shape.

(15) "Young Subscriber" writes: 1. The principal of our school says that snow cannot be cooled below 32° F. I don't believe it. Which is right? A. There is no reason why the snow may not be as cool as the surrounding atmosphere, or nearly so. If the temperature of the air is less than 32° the temperature of the snow will also be less. 2. On page 173 of Appletons' "Cyclopedia of Applied Mechanics," it says: "The injector considered as a pumping engine is not an economical machine." Then it says: "As a boiler feeder, however, it is more economical than a steam pump." Is the last of this true? A. The injector is the more economical as a boiler feeder, because the heat of the issuing steam is taken up by the feed water and delivered back to the boiler. 3. How many cubic feet of water an hour, per horse power, does the average steam boiler require? A. Average from 22 to 26 lb. of water.

(16) J. B. writes: I wish to know about raising water to run it by a pipe over a bank. From the water to the top of the ground is, say, 50 feet, and some say it cannot be done over 30 to 33 feet at most. I have never had it explained about the limit of raising only 33 feet. A. There is a possibility of drawing it over a bank 30 feet high from the surface of the water but you cannot do it practically over 26 or 28 feet. The pressure of the atmosphere raises the water, and that with your apparatus perfectly tight could not raise it over about 32 feet. You may so arrange your pump as to draw the water 26 feet and then force it the rest of the way.

(17) R. M. S. writes: 1. I want to drive the boat by foot power similar to velocipede motions and to have gearings connecting the propeller shaft. I want to know how large a propeller a man weighing 150 lb. can drive without much fatigue, also what pitch it should save. How many revolutions should the propeller make to the foot wheel? A. Make your propeller about 18 inches diameter. It should make 2 revolutions to 1 of the foot wheel. Pitch of propeller from 20 to 24 inches. 2. Can you estimate how fast the boat will go in slack water? A. The speed will depend upon the power applied. 3. Which would be best for the wheel, cast iron, brass, or sheet metal, to be light yet strong? A. Use brass or gun metal.

(18) J. A. F. asks: 1. Can crude petroleum be burned in a thrashing engine without altering the fire box? A. You need not alter your fire box, but place your apparatus for burning the oil at a proper height. 2. Would it not rid me of the trouble with sparks? A. Yes. 3. About what would be the difference in cost of fuel compared with wood? A. In some experiments compared with coal, it was found to be twice as expensive as coal. You can from this estimate the relative cost of petroleum as compared with wood.

(19) C. H. N. asks: 1. Is "Rose's Machinist," advertised in a recent issue, such a work as you would advise for a young machinist? A. Yes. 2. What railroad office would be the proper one to apply to for a position as assistant civil engineer in construction work? A. The chief engineer of the railroad.

(20) C. L. W. asks whether iron wire can be insulated by coating it with varnish, and if not how can it be insulated? A. It may be insulated with varnish, but a coating of kerite or guttapercha would be far better. If it is to be used in a dry place it will be sufficiently insulated if covered with cotton thread.

(21) J. B. asks: 1. How can I make a small mould from plaster of Paris? I want the casting to be very thin and small. A. SCIENTIFIC AMERICAN SUPPLEMENT, No. 17, contains full instructions for making plaster moulds. 2. How can I make a battery to do silver plating? A. Use a Bunsen or a Smee battery. See directions for making galvanic batteries in SUPPLEMENTS 157, 158, and 159.

(22) V. E. M. asks: Are there as many square feet, inches, and parts thereof in a square measuring 100 feet around (25 feet on each side) as in a circle measuring 100 feet around? If there is a difference please give it. A. To get the area of the square multiply together the length of the two sides, 25 by 25=625. To get the area of a circle multiply the diameter by itself and the product by 0·7854. A circle 100 feet circumference is $\frac{100}{3\cdot1416}=31\cdot875$ diameter, and $31\cdot875\times31\cdot875=1016$; $1016\times0\cdot7854=797\cdot966$. So the area of the circle is the greatest.

(23) R. C. writes: 1. I have a well 20 feet deep, with 8 feet of water. My house is 800 feet from the well, with a fall of 4 feet. Can I draw the water with a good pump attached to a windmill at my house and then force it into a tank 20 feet high? A. Yes. 2. Can I lay a pipe from the tank, passing the pipe around the fire box inside of my cooking stove, to supply the kitchen with hot water, without danger of bursting the pipe when the fire is hot and water not being drawn off? A. Yes, if your pipe is large enough to permit a double current. A better plan would be to use a house boiler and connect the pipes to it as in water back ranges.

(24) H. N. R. writes: My main line of shafting makes 300 revolutions a minute. I wish to run a small circular saw mill that requires exactly a reverse motion. Would the use of a gear on main line connecting with one on counter shaft be in any manner objectionable? Is it practicable to run the sawmill with an 8 inch belt with two idle pulleys so as to avoid crossing the same? A. Gearing would be objectionable at so high velocity. If you use belts, it will be necessary to have one crossed, and this should be the one having slowest motion, and it should have a good length. Belts are to be preferred.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

E. B. R.—No. 1 is finely laminated micaceous schist associated with a small quantity of steatite. No. 2, heavy spar or barite. The specific gravity of the specimen is 4·4. No. 3, limonite, containing about 80 per cent of oxide of iron. No. 4, magnetite, an excellent iron ore.—E. P. L.—No. 1 is not a hydraulic limestone; it might, however, yield a good agricultural lime if properly burned. No. 2, fibrous gypsum.—S. A. M.—No. 1 is iron pyrites. No. 2, hepatic pyrites, in which the sulphuret has been converted into oxide of iron. No. 3, the powder compares very favorably with that of bath brick.—J. R. B.—No. 1 is a readily fusible amphibole. Nos. 2 and 3, specular iron ore, the latter embedded in quartz.—W. M. F.—The powder consists of common salt and a number of other substances in small quantities. It is utterly useless for the purposes for which it is sold. It does not in any way prevent the explosion of light oils.—S. (Denver). Sample No. 1 is a mixture of argentiferous sulphide and carbonate of lead. No. 2 consists of porphyry associated with quartz which carries both silver and gold, probably a San Juan ore. The water in bottle marked F. W. & C. R. B., is of very good quality for potable purposes.

COMMUNICATIONS RECEIVED.

On the Relation of Springs and Barometric Variations. By M. G.

On Planets. By D. S. P.

On Edison's Carbons. By H. B.

On Ice Boats. By W. F. L.

On Life Preservers. By T. B. McC.

On Ice Yachts. By E. O. D.

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INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

December 23, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, or any patent issued since 1867, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Adjustable wrench, S E Hurlbut ... 222,787
Advertising frame, E J. Morrell ... 222,934
Air compressor, W. P Tatham ... 222,802
Annealing apparatus, E. J Watson ... 222,969
Atmosphere, apparatus for moistening the, J G. Garland ... 222,888
Axle, car G. W. Miltimore ... 222,833
Axles, machine for recutting wagon, A D. Goodell 222,820
Barrel head, F. G Johnson ... 222,791
Bed bottom, spring, C. T. Segar ... 222,955
Beer vessels, automatic pressure relief apparatus for Zwietusch & Heitmann ... 222,975
Belt stretcher, A. T. Green ... 222,896
Bidet and foot bath, combined, M Church ... 222,868
Billiard table chalk holder, A. N. Rouech ... 222,953
Bird cage, B. A. Drayton ... 222,877
Blind slat securer, G. H. Becker ... 222,855
Boiler, L S White ... 222,971
Book case. F G Johnson ... 222,911
Boot and shoe polishing machine, L. T Jones ... 222,792
Boots treeing, J E. Crisp ... 222,774
Bottle stopper, J B. Miller (r) ... 9,002
Bottle stoppering device, C F. Spencer ... 222,801
Bottles, elastic graduated cap for, J. I. Griffin ... 222,780
Brick machine, C. A. Hege ... 222,902
Broom head, E. W Shippen ... 222,957
Buckle, W J Carnes, Sr. ... 222,865
Bullet machine, J Moore ... 222,933
Bung bush, A O Muller ... 222,936
Burglar alarm, J. Decker ... 222,873
Burglar alarm, T Powell ... 222,949
Button working machine, F Loeper ... 222,923
Buttons to cards, machine for securing, S. L. Otic 222,837
Car coupling, J. A Hovey *et al* ... 222,785
Car coupling J B. & H. H. McCartney ... 222,926
Car for street railways, baggage, J Ascher ... 222,853
Car, railway, M. Nathanson ... 222,835
Car starter, J Hill ... 222,906
Carbine holder, H. Hartman ... 222,899
Carbureter, gas, C A. Howard ... 222,822
Carding machines, mechanism for stripping the top flats of G. H. Chandler ... 222,812
Carpet lining, A F Chase ... 222,813
Casting box, stereotype, M. J. Hughes ... 222,910
Casting car wheels, G. G Lobdell ... 222,922
Chandelier, extension, Clark & Kintz ... 222,771
Cigar box, W Fredricks ... 222,778
Cigar holder, C. Robinson ... 222,841
Clocks, twelve bells striker for, J. Kenmuir ... 222,913
Clothes wringer, Simpson & Gault ... 222,800
Cock for fluid pressure brakes, operating, G. Westinghouse, Jr. ... 222,803
Collar horse, J T. Turner ... 222,964
Cooker steam, H. C Patterson ... 222,838
Corset, C A House ... 222,908
Cotton scraper, A. R. Hill ... 222,905
Cream raising can, W. E. Lincoln ... 222,828
Cultivator, M. Holdredge ... 222,783
Cultivator, W. Pendley ... 222,940
Cultivator and cultivator tooth, C. W. Goodwyn ... 222,893
Ditching maching, Doan & Galloway ... 222,876
Doll supporter, J. S. Goye (r) ... 9,003
Drills, feed screw for, J. B. White ... 222,972
Egg stand and holder, T. B. Tattersley ... 222,961
Evaporating pan, F Perez de la Tega ... 222,942
Fabrics, machinery for guiding and stretching, W Birch ... 222,857
Fan attachment, W. M. Vestal ... 222,968
Faucet, J B Gathright ... 222,889
Faucet and cock, W. S. Cooper ... 222,870
Fence, G. S. Martin ... 222,925
Fence barbs, die for forming, W. Jenkins ... 222,976
Fertilizer distributer and seed drill, A. F. Giboney ... 222,892
File, bill, Brainerd & Fifield ... 222,810
Filter, O. Long ... 222,977
Firearm, magazine, B. F. Joslyn ... 222,912
Fire screen and blower, combined, W.T.Bradberry 222,860
Folding chair, table, etc., C. J. Everickx ... 222,883
Fruit drier, G. W. Deitzler ... 222,874
Furnace, F. Perez de la Tega ... 222,941
Gas analysis, apparatus for, A. T. Schuessler ... 222,843
Gate, J. D. Shannon ... 222,956
Gate, J G. Wilson ... 222,806
Glass bulbs, tool for opening and shaping the ends of, Jackson & McTighe ... 222,789
Glass shaping machine, Jackson & McTighe ... 222,790
Glassware, tool for flaring, O. P. Jackson ... 222,788
Governor, steam engine, G. F Pottle ... 222,946
Grain binder, S. D. Locke ... 222,829
Grain binder wire spools, tension device for, T. J Foster ... 222,777
Grain binders, compressor and detainer for, O. O. Storle ... 222,960
Grain meter, W. H. Allen ... 222,851
Grater, corn, G. Wood ... 222,974
Grinding mill, roller, W. D. Gray ... 222,895
Harness loop press, J. L. Barkley ... 222,808
Harrow coupling, A. B. Campbell ... 222,864
Harvester, J S. Marsh ... 222,978
Hats, manufacture of fur, I. Gill ... 222,891
Hay rake, horse, W South ... 222,958
Hinge, sliding and swinging gate, A. H. Huckaba. 222,786
Hobby horse, C. Brasch ... 222,861
Hog catcher, S. A. Wellman ... 222,850
Hoops, machine for cutting locks in, P. D. Pike ... 222,945
Horse boot, A. Randall ... 222,796
Horseshoe swaging machine, D. J & S Farmer ... 222,818
Hose, C. Callahan ... 222,770
Hose reel, W. Neracher ... 222,836
Hot air furnace, T. F. Hemmich ... 222,782
Hot bed, B Middleton ... 222,928
Inkstand, B. Brower ... 222,811
Knob attachment, J J Dinnan ... 222,817
Lamps with oil, supplying street, H. S. Belden ... 222,856
Latch, N Holmes ... 222,907
Lathe, button, J C. & H. J. Terry ... 222,962
Lathe, button blank turning, J. C. Terry ... 222,963
Lathe, oval, H. C. Heckendorn ... 222,901
Leather, finishing, E. W. Phillips ... 222,944
Loom, A. Pettis ... 222,943
Looms, automatic let-off mechanism for, Flanagin & Sager ... 222,886
Magneto-electric machine, T. A. Edison ... 222,881
Measure slips, machine for making, A.F.Molring 222,932
Measuring machine, cloth, A. F. Molring ... 222,931
Mechanical movement, F. A. Bishop ... 222,769
Mechanical movement, J. David ... 222,872
Metal tubes, machine for making, W C. Allison ... 222,852
Milk or cream, can for transporting, J G. Cherry. 222,814
Moulding machine, wood, L. Wenchel ... 222,970
Motion, device for transmitting rotary, M.G.Howe 222,909
Nail counter, W F. Daniel ... 222,816
Needles, machine for making, G. Cooper ... 222,773
Nut lock, W P Miller ... 222,929
Oiling fly nets, harness, etc., device for, L. S. Kurtz 222,827
Organ action, reed, J. H. Chase ... 222,866
Overalls, I. Lowenberg ... 222,921
Packing for condenser tubes, J. W. Mead (r) ... 9,001
Packing, piston rod, A Wilkinson ... 222,805
Pantograph, J. J. F Schnoor ... 222,798
Paper bags, revolving rack for, J. McMullin ... 222,832
Paper box machine, A I. Simmons ... 222,844
Paper dish and bucket, G. A. Dunn ... 222,879
Paper, etc., drier, B. R. Hawley ... 222,821
Pen, J. P. Wallace ... 222,847
Pen, fountain, W. W. Stewart ... 222,959
Pianoforte, J C. Ward ... 222,848
Planter check row wires or cords, reel for corn, R. H. Avery ... 222,854
Planter, corn and cotton, R. H. Rhea ... 222,797
Plow, A. Goodyear ... 222,894
Pneumatic elevator and conveyer, E. J. Hatch ... 222,900
Pneumatic motor, Reynolds & Haupt ... 222,950
Poison upon vegetation, machine for sprinkling liquid, F. I. Marsh ... 222,831
Poke, animal, G. E. W. Herbert ... 222,908
Polishing iron, H. J. Welch ... 222,849
Printing from plates of gelatine, E. Edwards (r) ... 9,000
Railway tenders, apparatus for supplying water to, T. Leininger ... 222,918
Reaper, thrasher, and separator, combined, R. J. Clark ... 222,772
Refrigerator, S. W. Loller ... 222,924
Registering apparatus, E. R. Moffitt ... 222,834
Rein holder, T. H. Lucas ... 222,830
Reins, hand hold for, H. B. Powell ... 222,947
Rocking chair, A. C Brittan ... 222,862
Rolling mill, S. R. Wilmot ... 222,973
Rolling mill feed device, F. J. Slade ... 222,845
Roofing, metallic, L. L. Sagendorph ... 222,852
Saddletree, side, J. R. Gathright ... 222,890
Sash cord guide, T. Van Wagoner ... 222,967
Sash fastener, T. Powell ... 222,948
Sash lock, T. F. Lemassena ... 222,919
Saw mill, circular, A. Cunningham ... 222,775
Saw mill head block, D. Lane ... 222,915
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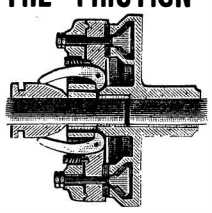

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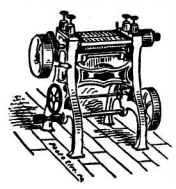

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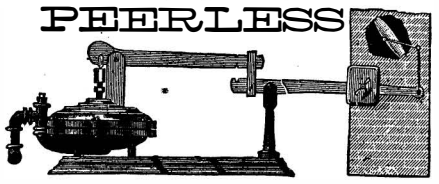

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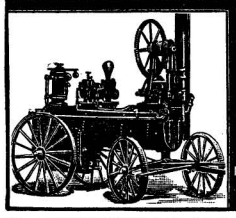

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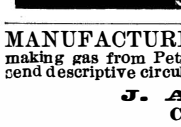

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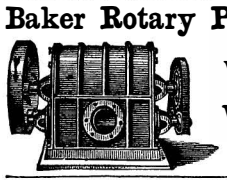

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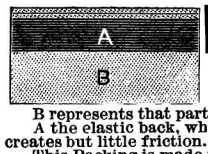

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B represents that part of the packing which, when in use, is in contact with the Piston Rod.
A the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.
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NASAL AND BRONCHIAL CATARRH

TO THE READER.

Can you comprehend, in its terrible significance, that this disease is more fatal to mankind than all the fevers and other ailments we know of? or the millions of people that labor under it? Many often are unconscious of its ravages until the discharge from the nose and throat bring it painfully home to them, in the ineffective efforts to cough and expectorate the offensive matter. Can anything be more disgusting to the on-looker than this spectacle? Yet none are so frequent. You will find it in every street car, in every public conveyance. This is only the beginning of the disease. It requires instant scientific treatment. From the delicate organization of the parts affected, there is no time to lose; nothing but the most decided measures will arrest the silent progress of this cruel malady. There must be no neglect.

CATARRH AND AMERICANS

There are few among Americans who do not know by experience some of the symptoms of this disease, and upon many it has fastened itself with a tenacity which defies the skill of the ordinary physician. The "hawking" and spitting for which Americans are sometimes ridiculed by foreigners, are due to this disease, produced by the peculiarly changeable nature of our climate on account of which colds are contracted, and settle in the head, and pass thence to the throat and lungs.

ADVICE THAT SHOULD BE HEEDED.
Do Not Use Nostrums.

REV. WM. ANDERSON, Fordham, New York, writing to a friend in Andover, Mass., says of Childs' Catarrh Treatment:

I would advise you to write to Rev. T. P. Childs, Troy, Ohio. His remedy you can rely on; and, if you can be relieved by medication, his remedy will afford you certain relief. It is the only reliable treatment for catarrh I have known. Do not use those nostrums advertised unless your physician can recommend them. They seriously injure the healthy parts. Rev. T. P. Childs' remedy is indorsed by three physicians in his town. Yours truly, WM. ANDERSON.

THE ENTIRE FAMILY OF A MISSIONARY CURED.
Childs' Treatment all it Professes to be.

Rev. Thomas Allen, now residing in Dayton, Ohio, after twelve years' service in India, accepted the position of District Secretary of the American Baptist Missionary Union for Ohio and West Virginia. The entire family contracted catarrh in its worst form while in India. Their wonderful cure Mr. Allen relates himself. Mr. Allen has a wide reputation, and the cure of such prominent men is worthy the attention of all the afflicted.

REV. THOMAS ALLEN, District Secretary of the American Baptist Missionary Union, sends us the following:

DR. CHILDS—*Dear Brother:* This is to certify that I have used your *Catarrh Specific and Cold Air Inhaling Balm* in my family with the most beneficial results. My son, now in Madison University, New York, was so badly afflicted with *Catarrh* I feared for a time that he was incurable; and, when I applied to you for medicine my hope was faint. It acted speedily and efficiently, and I believe saved him from an early grave. He is now perfectly cured. My wife, who had become very much reduced by a residence in Farther India, as a missionary, has derived great benefit from your *Inhaling Balm.* I can most heartily commend these medicines to the afflicted, believing they are all they profess to be. Truly your brother, THOMAS ALLEN.

THE CHANCELLOR OF THE UNIVERSITY OF NEBRASKA CURED.

Too much stress can not be laid upon the following testimonial. Dr. Fairfield is well known all over the United States as a man of high standing, learning, and great eloquence in the pulpit. He is at present the *Chancellor of the University of Nebraska,* Lincoln, Neb. Prior to the use of *Childs' Catarrh Specific* he had entirely lost the use of his voice, and was compelled to suspend his daily lectures. The fact that *Childs' Catarrh Specific* restored so prominent a man to usefulness and health, should convince the most skeptical that their cases are not hopeless.

CAN LECTURE DAILY.
CHILDS' CATARRH TREATMENT THE TRUE THEORY.

REV. T. P. CHILDS—*Dear Sir:* I think you have the true theory and practice for cure of Nasal Catarrh, and also for the treatment of the respiratory organs. My throat is now so well restored that I lecture daily without any difficulty, and find no difficulty whatever in preaching. You are at full liberty to use my name for the benefit of others. Yours very truly, E. B. FAIRFIELD, D.D LL.D.

A LEADING OHIO JUDGE CURED.
A THOUSAND THANKS FOR CHILDS' TREATMENT.

JUDGE J. COLLETT, of Lima, O., writes: "You will remember how terribly Catarrh had taken hold upon me. Now I am cured; head free, air passages all open, and breathing natural. I express to you again what I said in a recent letter, 'A thousand thanks to you for so sure a remedy and so very cheap.'"

My Experience with Catarrh.

Eighteen years of terrible headache, disgusting nasal discharges, dryness of the throat, acute bronchitis, coughing, soreness of the lungs, raising bloody mucus, and even night sweats, incapacitating me for my professional duties, and bringing me to the verge of the grave—ALL were caused by, and the results of NASAL CATARRH. After spending hundreds of dollars and obtaining no relief, I compounded my CATARRH SPECIFIC AND COLD AIR INHALING BALM, and wrought upon myself a *wonderful cure.* Now I can breathe freely in any atmosphere. At the calls of numerous friends, I have given my cure to the public, and have now thousands of patients in all parts of the country, and there are thousands of happy men and women whose sufferings I have relieved. My cure is *certain, thorough, and perfect,* and is indorsed by EVERY PHYSICIAN who has examined it. If I can relieve my fellow beings as I have been relieved of this loathsome disease, which makes the possessor at once disgusting to himself and others, I shall be satisfied, and feel that I have done my little toward removing the ills of mankind. T. P. CHILDS.

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REV. T. P. CHILDS—*Dear Sir:* I have suffered from a severe cough most of the time for the past four years. Physicians have told me it was caused by chronic inflammation of the bronchial tubes. I procured some of your Cold Air Inhaling Balm, with other medicines, about the middle of last January, and have used it since with most satisfactory results. I have not been so nearly free from a cough during the past four years as I am at this present time, and the result is wholly due to the use of your balm, which I heartily recommend to that large class of invalids who have consumptive tendencies. Very respectfully yours, MRS. J. H. BULLARD, Springfield, Mass.

PASTOR IN NEW JERSEY DOES NOT REGRET THE COST.

I do not regret the money it cost in using your medicine. I can heartily recommend your treatment.
Yours, E. J. LIPPINCOTT, Clarksboro, Gloucester County, N. J.

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Your treatment cured me; your inhalers are excellent. This is the only radical cure I have ever found.
E. S MARTIN, Pastor M. E. Church, Port Carbon, Pa.

MINISTERS, LAWYERS, TEACHERS,

Who are constantly using their voice, should be watchful of the first approaches of Catarrh. After the dreadful suffering through which I passed, I can not too strongly urge upon my brother speakers the necessity of care. If Catarrh has obtained a hold, send at once and obtain my CATARRH SPECIFIC, and commence the treatment at once. You may save yourself years of agony.

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Unlike a patent medicine, or the many so-called Catarrh cures advertised, CHILDS' CATARRH TREATMENT must be adapted to the wants and constitutional needs of each individual patient. A knowledge of this is of the first importance, and of this we make a special study. We use in our treatment the best instruments, nicely adapted to the skillful treatment of this disease, and yet so simple that the patient can use them with perfect safety and without pain.

Childs' Treatment for Catarrh, or for the diseases of the Bronchial Tubes, can be taken at home, with perfect ease and safety, by the patient. No expense need be entailed beyond the cost of the medicine.

J. H. Green, M.D., a physician of twenty years' general and special practice, is now associated in the business, and will pay special attention to all diseases of the Upper Air Passages and to Affections of the Ears, and will prescribe where constitutional treatment is necessary.

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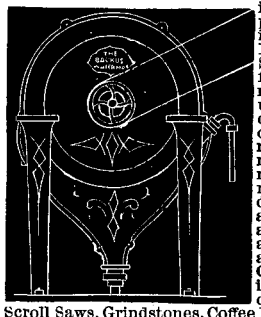

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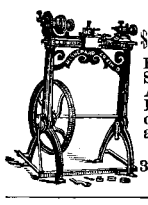

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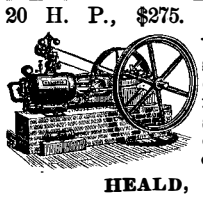

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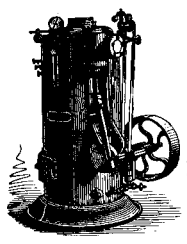

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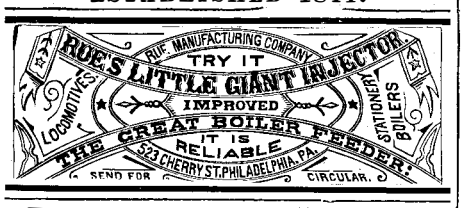

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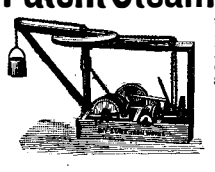

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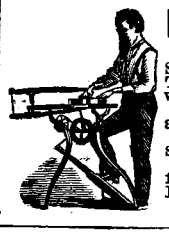

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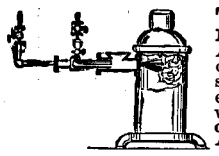

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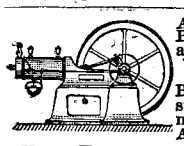

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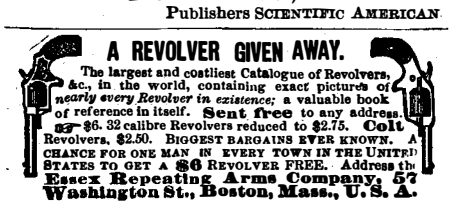
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